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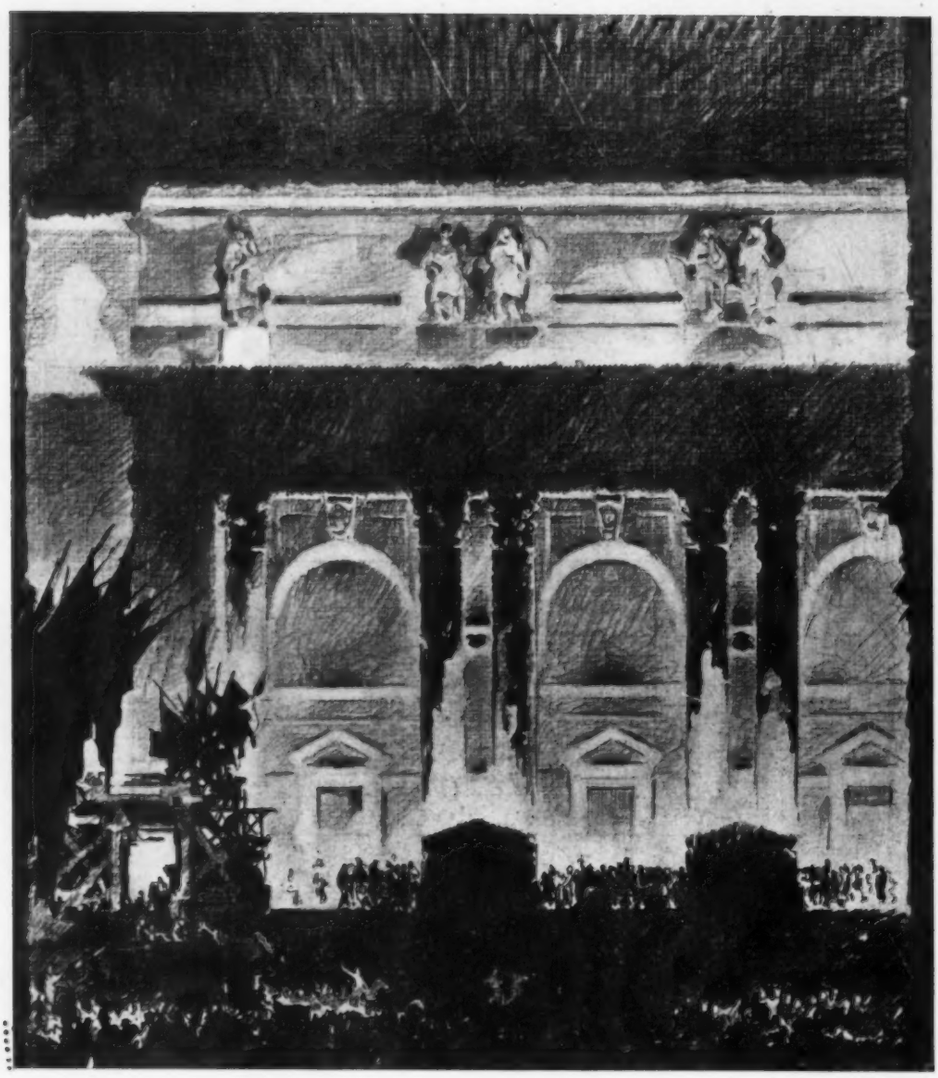

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The
ARCHITECTURAL
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VOLUME XXXIII NOVEMBER 1920 NUMBER 5

Schoolhouses in Massachusetts

By WILLIAM ROGER GREELEY
of Kilham & Hopkins, Architects

PRESENT construction costs necessitate the most careful consideration of the fundamental principles of planning. In this article there are presented facts and figures based on the experience of Messrs. Kilham & Hopkins in schoolhouse planning, in the belief that a frank discussion of costs is of value at this time. We will be glad to have similar expressions from other architects. — EDITORS.

A SCHOOLHOUSE is a contrivance to protect children from the inclemency of the weather while they are being educated. They do not need to be protected from fine weather, but, from the habit of remaining in the building during the winter we drift into the belief that it is dangerous for them ever to be in the open air. They should be educated to prefer open air.

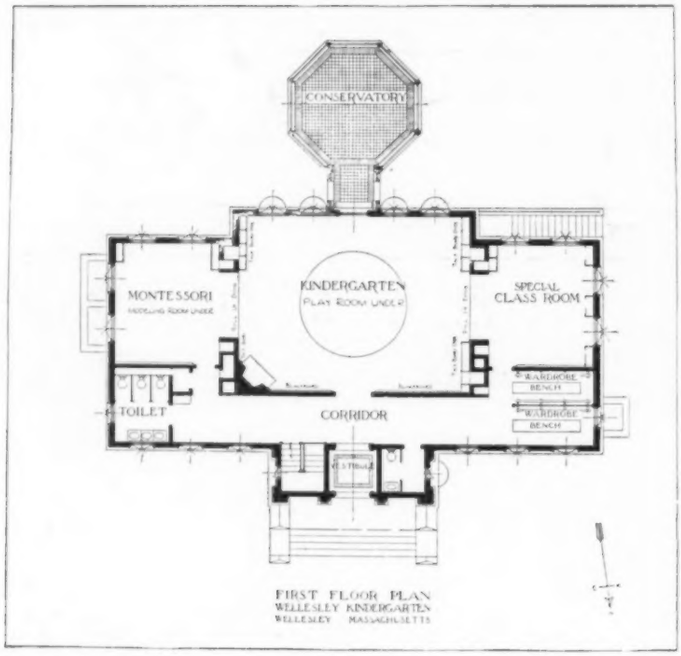
Essential Items

1. A roof. The principal intent of a roof is to keep out rain. Therefore a roof should not leak. Architects should bear this in mind. A roof that leaks does not serve its purpose by any means.

2. Walls. The intent of walls is to keep out rain, wind and cold. Therefore they should admit as little rain, wind and cold as possible. They also serve to hold up the floors and roof, so they should be strong.

3. Floors. The purpose of floors is to provide an area upon which to stand and sit, and place furniture. It is well to have floors smooth, even and level. As dirt is shaken off upon them, floors should be capable of easy cleansing. As they are subjected to extreme wear, they should be durable. As many feet drum upon them constantly, they

Kindergarten Building for the Town of Wellesley, Mass.
Kilham & Hopkins, Architects



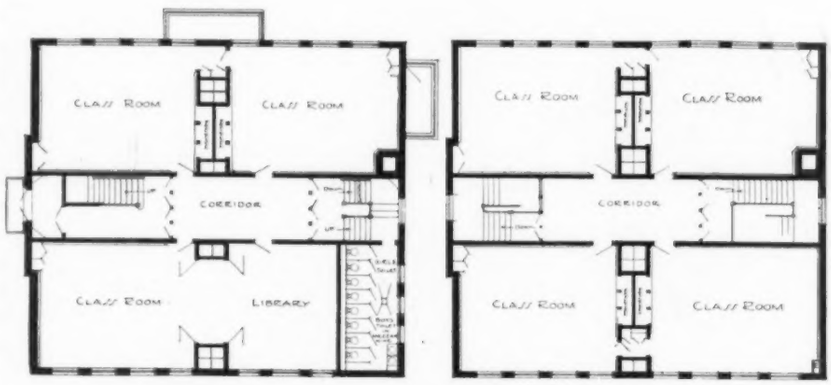
should be sound-absorbing. Only a few flooring materials can be found that will fulfil all these requirements, and the best are high priced.

4. Partitions. The intent of partitions is presumably to separate rooms, to keep out noise, and to furnish convenient areas for blackboards, maps and clothes hooks. Partitions should be sound deadening, and, as the requirements for sizes and character of rooms change from time to time, it is well to have the partitions independent of the structure, so that they can be moved or removed. This is so seldom done that it is worth mentioning.

5. Windows. Windows are provided to admit light. Where pupils are anchored to desks and made to study there for hours, windows must be carefully placed to give a moderate light that will not shine into the pupils' eyes. Windows, if they were permitted to do so, would admit fresh air to the rooms. Unhappily a belief prevails that fresh air should not come into contact with a child, until its freshness has been removed by baking on steam pipes. It may then be admitted to the presence of the pupil in small quantities through a hole in the partition. In this way the child's body is educated not to resist varying conditions of temperature, and the child learns to keep indoors all its life, and avoid all the dangers of vigorous good health. This hot-house variety of child is distinguished by pallor and lassitude. It is becoming a standardized product of the pump-fed air chambers of our public schoolhouses. In many parts of our country, windows are opened to flood the rooms at intervals with fresh air. In some states it is illegal to do so.

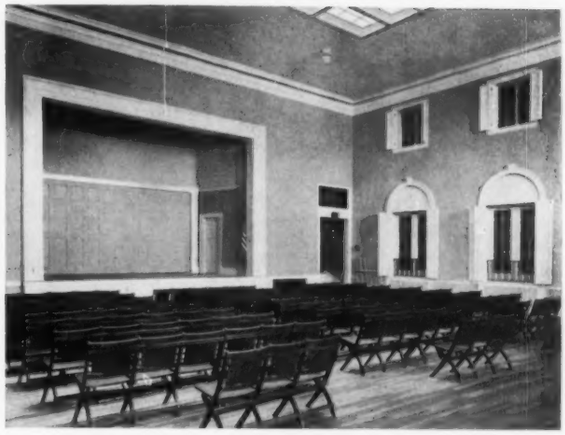
6. Stairs. Stairs are to enable occupants to pass on foot from one level or floor to another, and to the ground outside. In case fire or other accident should block a stair there should be another so located as to afford ready escape.

Owing to the cost of building these protective cells that we call class rooms, teachers cannot be afforded in sufficient numbers, and forty or more pupils are put in the charge of one woman. A building with ten class rooms and hall, all furnished for occupancy, costs $150,000 or more. This amount at interest would provide $9,000 a year, and the cost of running such a building would amount to $6,000 more, a total of $15,000 per annum saved if the building were not built. This would pay for ten of the very finest teachers in addition to increasing the pay of the first ten, giving a first class teacher to every twenty pupils instead of a second rate teacher to every forty. In other words, if it were not for our buildings our teaching force could be increased one hundred per cent in numbers, and improved in quality proportionately. It costs us as much to protect the children from cold, wind, and rain as it does to educate them! Every time we pay a teacher ten dollars for teaching we pay ten dollars more for protecting them from the weather! It therefore becomes a matter of importance to use every means possible to reduce the amount of structure required to house our pupils. The alternative is greater efficiency through more extended use of existing facilities but this solution is not generally popular.



First and Second Floor Plans, Riverdale School, Dedham, Mass.
Kilham & Hopkins, Architects

Kindergarten Room



Assembly Hall

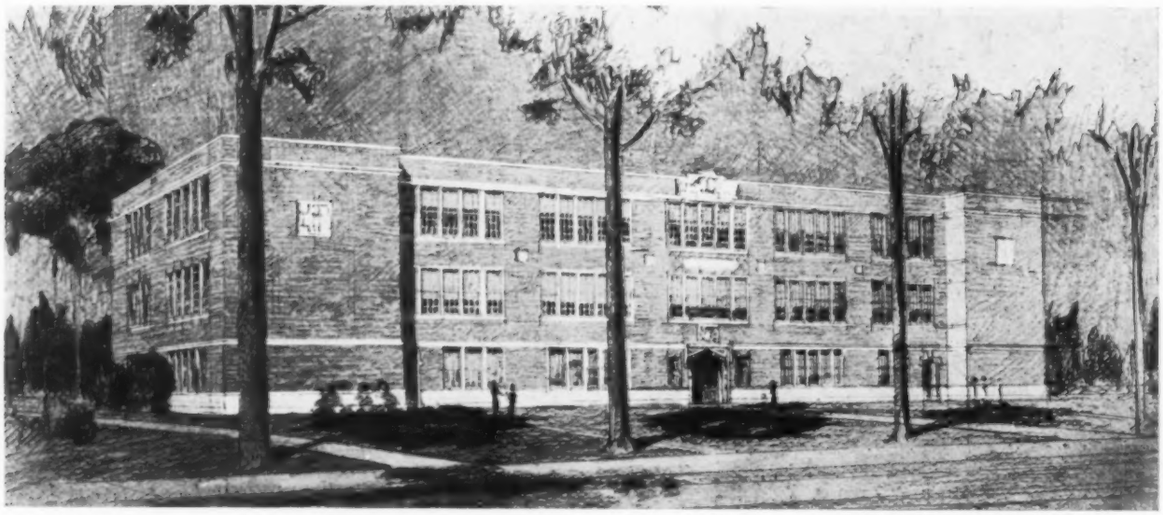
How to Figure Costs

The community that is planning new school accommodations appoints a committee to report on costs, site, architect, etc. Their function is to inform themselves as to conditions and to act as advisers to the community. This committee will find in the course of its investigations many references to "cost per square foot" and "cost per cubic foot." The citizens who will vote money for the new building know little and care less about

General View of Main Front

The Banks School, Waltham, Mass.

Kilham & Hopkins, Architects



Perspective Drawing of the Lincoln School, Framingham, Mass.

square or about cubic feet. What they need to know is how much it will cost to house a given number of pupils. The *cost per pupil* is the significant unit to quote to them. Schools of like accommodation can be compared on this basis. Our school buildings may be divided into a number of types for the purpose, something as follows:

1. Kindergarten (such as the Wellesley Kindergarten shown herewith).

2. Primary and intermediate school buildings with class rooms, toilets and administration rooms only (such as the Riverdale School, shown herewith).

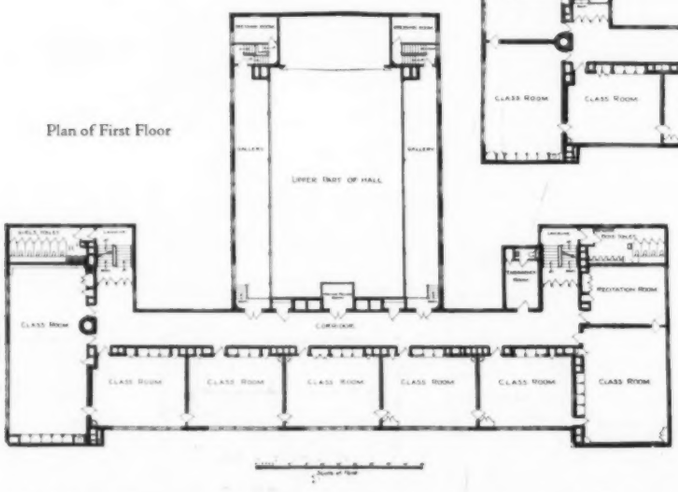
3. Primary and intermediate school buildings with class rooms, toilets, administration rooms and hall.

4. Primary and intermediate school buildings with special equipment of one kind or another, each individual (such as the Banks School, Waltham, shown herewith).

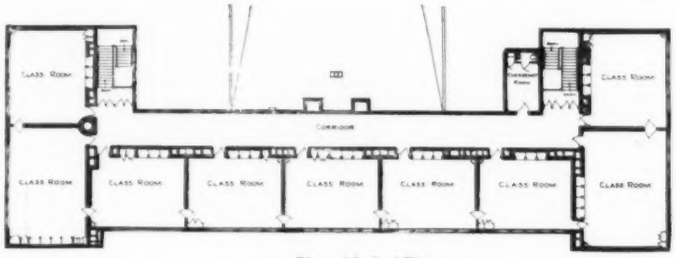
5. Junior High. Class rooms, manual training, sewing, cooking, lunch room, physical department rooms, hall and gymnasium (combined), library, study and recitation rooms and administration rooms. (The Lincoln School is of this type.)

6. High Schools. Of varying types referred to later.

The above classification furnishes a sound basis



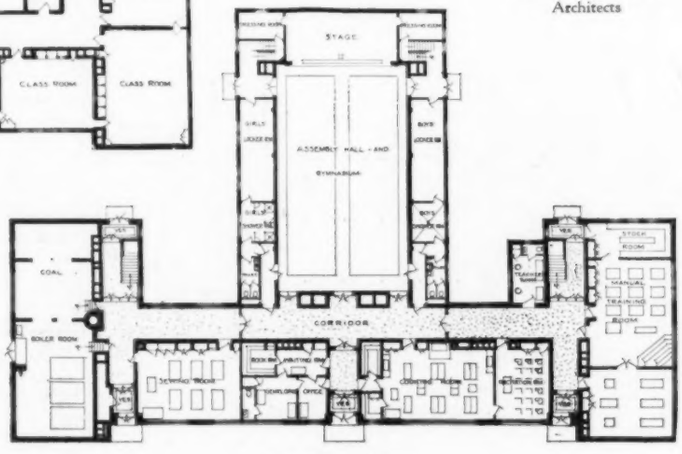
Plan of First Floor



Plan of Second Floor

The Lincoln School, Framingham, Mass.

Kilham & Hopkins
Architects



Plan of Ground Floor

for comparison of per-pupil or per-class room costs.

Since 1900 costs have at all times been on the increase. The following table shows per-pupil costs in elementary schools done in the office with which the writer is associated. It also shows cubic foot costs.

Date	Cost per Pupil	Cost per Cubic Foot
1898	$94.00	$0.08
1903	155.00	.10 –$ .12
1906	126.00	.157
1909	127.00–$165.00	.154 - .174
1910	145.00– 187.00	.156– .17
1911	130.00– 135.00	.193– .194
1915	*110.00– 113.00	.179– .19
1920	260.00	.54

*Reduction in cost due to planning several schools in one "group."

The increase in the cost per pupil since 1898 has been 176% while the cost per cubic foot has increased 575%. All along the line the increase in the vital cost—the cost per pupil—has been less than in the cost of construction, *i.e.*, the cost per cubic foot of building. This relationship indicates increasingly economical and probably more scientific methods of planning.

The more expansive and the looser the design, the less will be the cost per cubic foot, and the more per pupil; while the more compact the plan, the more the cubic foot cost and the less the cost per pupil. As an illustration, the old style pitched roofs added a great deal to the cubage of the building and hence reduced the per cubic foot cost, though the cost per pupil was higher than with the flat roof type. The Chicago wardrobe system, minimum sized rooms, etc., are further illustrations. In 1903 our office designed an elementary school at 10c. per cubic foot and $115 per pupil; 12 years later another at 19c. and $113 per pupil. Here the

High School at Taunton, Mass., before Remodeling

cost of the building was almost doubled, while the cost per pupil was slightly less in the later structure. More compact and simple planning, made obligatory by the rising cost of building, alone can explain so great a discrepancy.

In the earlier grade schools of Class 2 cited above the number of cubic feet per pupil was slightly over 1,100. The 1906 school was 800. In 1911 the amount dropped below 700. In the kindergarten building (Class 1) it was 981, in the Class 3 school of 1919, 993, and in the Class 5 (junior high) now being built at Framingham, Mass., it will stand at 886 cubic feet. The low record is for a Class 2 school now under construction at 477 cubic feet per pupil. This represents an extreme in economical planning.

The high schools of the earlier years varied from 1,300 to 1,600 cubic feet per pupil. The High School of Commerce in Boston, 1914, came to 1,100 cubic feet, the Dedham High School to 1,013, in 1915, and the remodeled Taunton High School in 1917 showed a cubage of 1,010 per pupil.

The Present High School at Taunton, Mass. Kilham & Hopkins, Architects for Remodeling

These figures may be of assistance to the architect in estimating the size of a proposed school, but the variation in plan and in the individual site requirements necessitates more detailed figures before determining the amount of an appropriation. In order to determine the amount of appropriation to be required a preliminary study is necessary, and should be authorized, with a small appropriation for the employment of an architect to make this study.

The above illustrations indicate the varying relations between the cost per cubic foot, which interests the building engineer, and the cost per pupil, which is of vital importance to the school committee and the tax payer.

The statement of cost should include everything that the town has to pay, except the cost of the land. Comparisons are made of little value if this item is included, because it varies so greatly. In a large city it may be $400,000 an acre; in a small town, $400. The other factors are comparatively comparable,—(1) cost of building, (2) cost of furniture, (3) cost of architects, engineers and incidentals (say 10%), and (4) cost of necessary or ordinary grading and planting.

As an example of the cost of a carefully planned school of Class 2, the Riverdale School now under construction at Dedham, Mass., furnishes the most recent figures. The cost per pupil of building, furniture, architects' and engineers' fees and incidentals is about $285. The cost per class room is about $10,000.

Class 3 is dwindling. Schools with class rooms and a hall are today usually equipped with sewing, cooking, or manual training rooms in addition. This puts them in Class 4. A building of this class just completed in Waltham shows a cost per pupil of $283. The contract was let, however, in June, 1919. The special rooms are manual training, sewing, cooking, lunch, physical measurement, library, book-repairing, and nurse's room, separate toilets and coat room for outside public using auditorium.

Under Class 5 we are constructing a 16-room school building contracted for in November, 1919, which is costing $340 per pupil. There was a sharp rise in building costs between June and November, 1919.

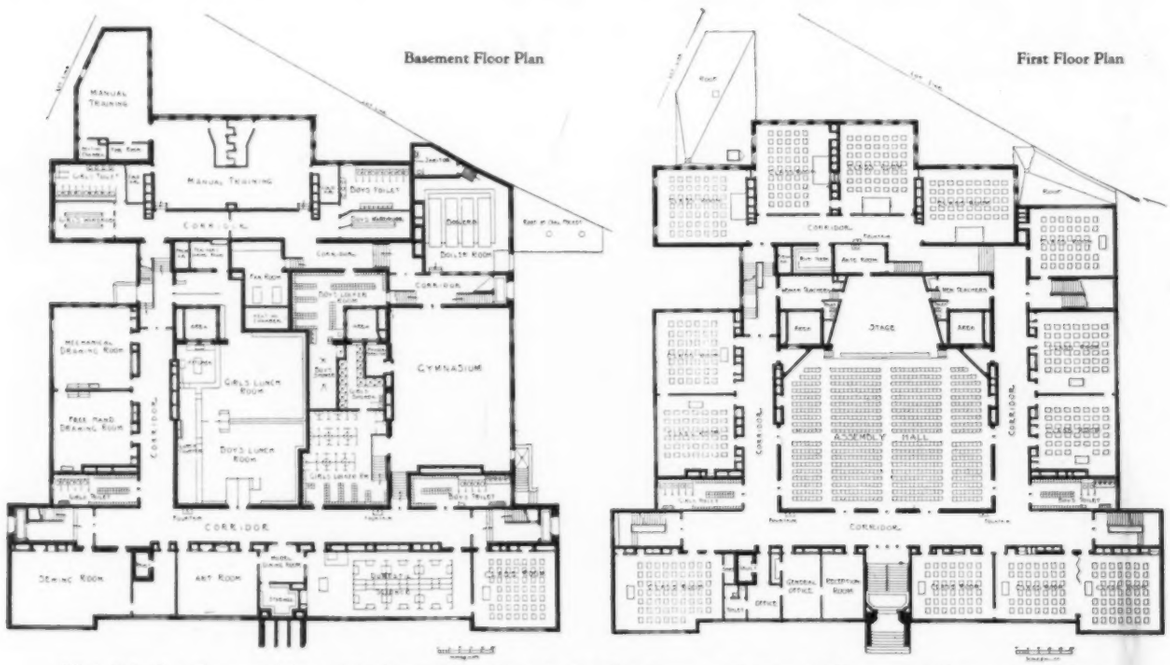
Under Class 6 there is much variation, and comparisons are likely to mislead. Some observations upon recent experience may, however, be of value.

The Haverhill High School (1910) cost $.152 per cubic foot and $240 per pupil. The same building today would cost at least $750 per pupil.

The Dedham High School (1915) cost $.192 per cubic foot or $195 per pupil, and might cost today somewhere around $500 per pupil.

The Taunton High School is an interesting example of the value of altering an existing structure. Although the alterations were made in 1917–18 the cost per pupil appeared to be only about $200, an exceptional figure, resulting from the careful use of every valuable feature of the old building.

In the above analysis the consideration of beauty is not included. While there can be no possible difference of opinion in regard to the advantage of beautiful school buildings over ugly ones, it seems reasonable to say that the present conditions governing construction call for beauty of the simplest type, adapted closely to the most economical forms of construction.



High School at Taunton, Mass. The Second Floor Contains 10 Class Rooms, 3 Commercial Department Rooms and a Library
The Third Floor Has 2 Lecture Rooms, 3 Laboratories and a Class Room

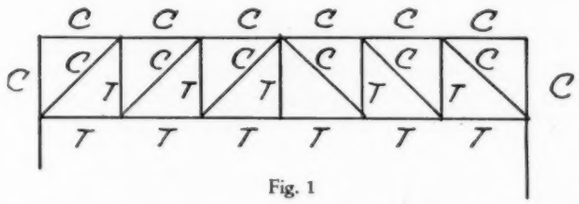
Truss Design and Details

PART I. WOODEN TRUSSES

By CHARLES L. SHEDD, C. E.

WOODEN structures are the oldest form of building in use except masonry and are the simplest to construct as they may be built by the ordinary carpenter or any one handy with tools. When the beams span long distances or carry large loads it is necessary to use more complicated framing to provide sufficient strength or economy or to prevent too great deflection. To accomplish this result the use of wooden trusses was developed.

While the construction of these trusses does not require skill, the proper design where long spans or large loads are encountered does require much more skill than the design of ordinary steel columns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cated stresses in the joints themselves. It is much more common in wooden trusses than it is in steel trusses to find this rule not exactly followed. Usually the cause of departure from the rule is economy in the design of the joints. (See Fig. 2.) Center lines A, B and C intersect at a point in the ideal way, but center line D does not intersect at the same point. This is done to make the casting smaller and the member is chosen which has the least stress in it to accomplish the result. In a heavy Howe truss, if this rule were strictly adhered to, the castings would be quite large; therefore, these intersections

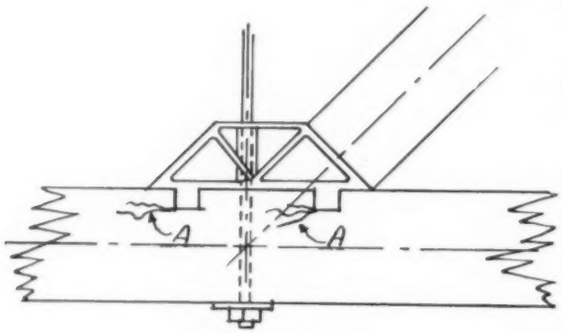


Fig. 3

are not exact but vary by a few inches especially in the case of counters and near the center of the truss. With proper care the resultant eccentricity does not amount to a serious thing because the chords are usually quite stiff in proportion to the web members.

In so-called wooden trusses the principal material obviously is wood, but to complete the details and take tension, other materials are used including steel, wrought iron and cast iron.

Spruce is only used for the lighter trusses and even in such cases is not as common now as a few years ago when the difference in cost between it and yellow pine was greater. For a number of years yellow pine of the same strength as spruce has been more economical.

Yellow pine is usually the best material from all points of view to use for the compression members and bottom chord of a wooden truss. It is more easily and accurately worked than fir, therefore the joints can be made tighter with less liability to injure the stick.

Recently, and especially during the war, fir was substituted for yellow pine as it was more readily obtained, especially in the larger pieces. It has, however, not proved very satisfactory and should be avoided where any amount of notching or framing is to be done. The grain is coarser and more irregular so that when notches are made for the lugs of castings and so forth, it is quite likely that shearing will occur directly along the grain, even before the truss is completed. (See Fig. 3.) In one case which the author noticed, over one-third of such notches had sheared in a series of trusses, and as it happened the shear had usually occurred just where it would be due to the stresses when the truss was loaded and in use. It is obvious that such defects would seriously impair the strength of the truss.

Oak is used in some cases in building on account of the finish which is desired and frequently in lighter trusses it can be used in small blocks at the joints in place of cast iron. (See Fig. 4.) It is also used in small blocks between members composing a chord of a truss to act as separators where the whole chord, if composed of one stick, would be of too great a size or where, due to the vertical rods, greater economy can be obtained by the use of several sticks of smaller size.

Oak is a very satisfactory wood to use when it can be obtained at a reasonable price. It can be accurately worked and its durability is greater than most kinds of wood. It is stronger so that less material is necessary than with other varieties.

Steel is used for the web members in tension and sometimes to reinforce the bottom chord when the stresses are too great in it to be taken conveniently by the wood. When a wooden stick is used in the bottom chord to take the tension it has to be made sometimes twice as large as would be used if it were not for the notches cut in it for the details at the joints. The bearing plates for the tension rods are made either of steel or wrought iron.

Wrought iron members are often used when the stresses to be taken care of are not too great, because they are often cheaper and can be more readily obtained. They must be larger, however, than steel members of equal strength. Another advantage of wrought iron over steel is that when it is subjected to moisture and attendant rust it does not depreciate nearly as rapidly. It can often be used for bearing plates in place of steel and here too it has to be thicker to do the same work.

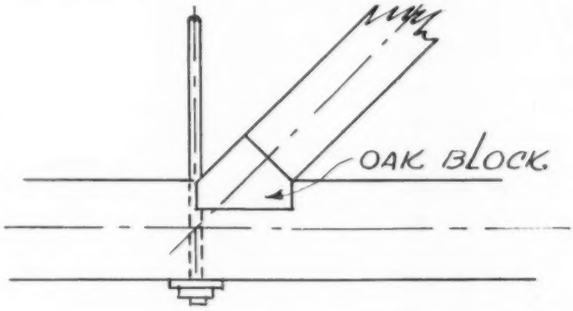


Fig. 4

Cast iron is used at the joints to complete details where ordinary notching or framing would be wasteful. In such cases these castings are of considerable size and are made of ribs with hollow places between them to reduce the cost and make them easier to handle.

Lastly, at the joints, nails, spikes or bolts are used to hold the members in place especially after seasoning of the wood takes place. These nails and spikes are very seldom actually figured to take any stress but the bolts are often designed to transmit some definite stress at the joints.

Tile and Its Installation

PART II

By E. STANLEY WIRES

TILES are appropriate for all uses where a material is required that is artistic, easily cleaned, durable, economical, fire proof and of great sanitary value. Tile is entirely inorganic and is therefore odorless and not subject to decay. A factor that lends additional desirability to the lighter shades of tile from a sanitary view, is their light-reflecting property. Bacteria and spores are killed by reflected light as well as by direct sunlight. The matter of light reflection is of interest in connection with the hospital operating room, where the intensity of illumination can be regulated and the "glare" overcome by the use of various colored tile. Since light reflected from the floor and below a six-foot wall line can shine into the operator's eyes, experiments have been made with floor and wainscots in color, retaining the lighter shades of tile above. Results show that colors from the middle of the spectrum are best adapted to the requirements. Colors from the red end of the spectrum are not advisable since they entail pronounced chemical changes in the retina, producing over stimulation and fatigue. Green and gray have proved satisfactory. Green was selected because it is a complementary color to the red of blood and the eye looking back to the wound can carry none of the green impression from the floor or wall. A further reason for the selection of colors from the less luminous end of the spectrum is that these colors permit pupilary dilation, so that the eye looking up from the red wound and seeing the green would have a large pupil when it looked back. If on the other hand the eye looked at white the pupil would contract. The following table of absorption should be of interest:

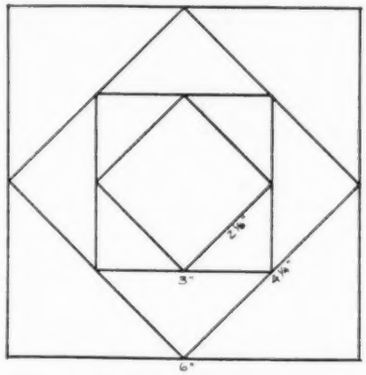
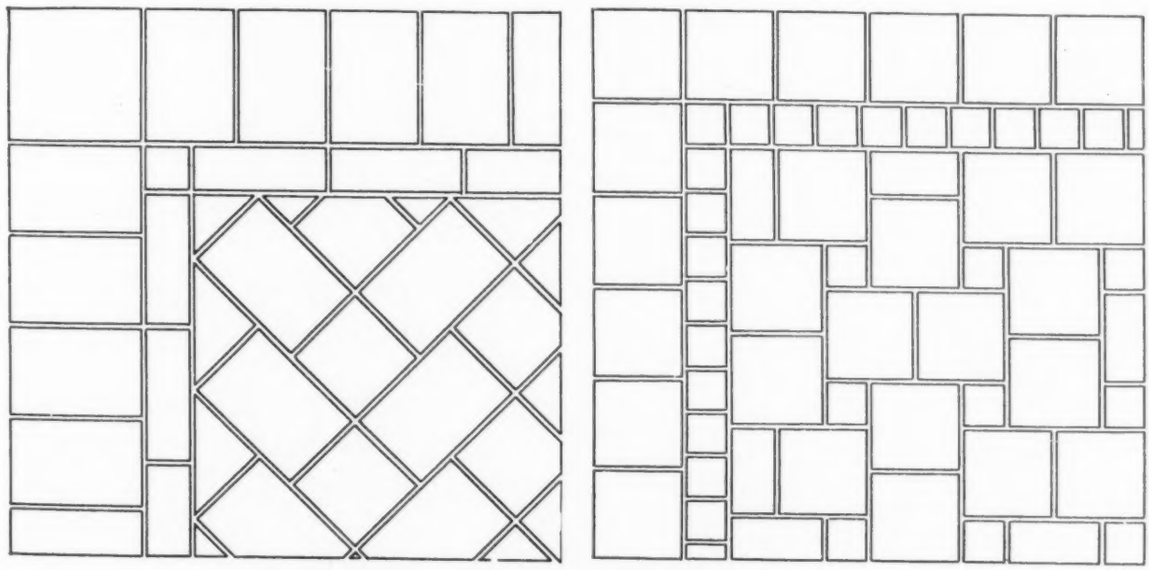


Diagram of Standard Units that Size with Each Other for Diagonal Halves

RELATIVE ABSORPTION OF COLORS

White,	18 per cent
Orange,	50 " "
Yellow,	60 " "
Pink,	64 " "
Emerald Green,	82 " "
Dark Brown,	87 " "
Vermilion	88 " "
Cobalt Blue,	88 " "
Deep Chocolate,	96 " "

These characteristics associated with tile are called for not only in the home, but in industrial buildings, where success is measured by the good health of the wage earner; in community and housing groups where hygienic results are highly important; in association and hospital buildings, and many public buildings where artistic treatment and warmth of color are desired. Unfortunately there are very few catalogues that show good sug-



Designs for Simple Tile Floor and Border in Standard Sizes

gestions for the use of tile, and those that do, give only very limited ideas. Neither descriptions nor illustrations can give any idea of texture and color. A well organized firm is not dependent upon the product of any one factory, but can design in a combination of several kinds of tile, and can best lay out the detail of the work subject to the architect's criticism. One of the first requisites for a tile designer to understand is the underlying principle of tile sizes. The sizes made by the "Associated Tile Manufacturers" size with each other as shown in the accompanying diagram.

The designer must also know that very few full glazed tiles are suitable for floor work, excepting where the wear is not extreme. As a rule the soft colored tile, especially the browns and dull reds, laid in simple patterns are the most attractive. In using color, care should be taken to avoid strong contrasts, and designs that are restless or uneasy. In small scaled floors more latitude can be used in the use of color, but the desired effect is very easily overdone. Tile combined with brick or stucco for exterior insert work has many possibilities and should be used more for this purpose.

Jointing of white glazed tile is a matter of good workmanship and superintendence, rather than a matter of carefully worked out design on paper. Too tight a joint is not recommended for any kind of tile work, and the more irregular the material the wider the joint should be. For tile with rounded edges the joint should be recessed to allow for the full face value of the tile.

In "sectile" work the joint is used as part of the design. The tile fit together very much like a picture puzzle, the important outlines being true joints and the other lines counter sunk to be grouted in the same manner as the regular joints. This method of installation opens a field for the execution of the very best "mural" decoration in a permanent material.

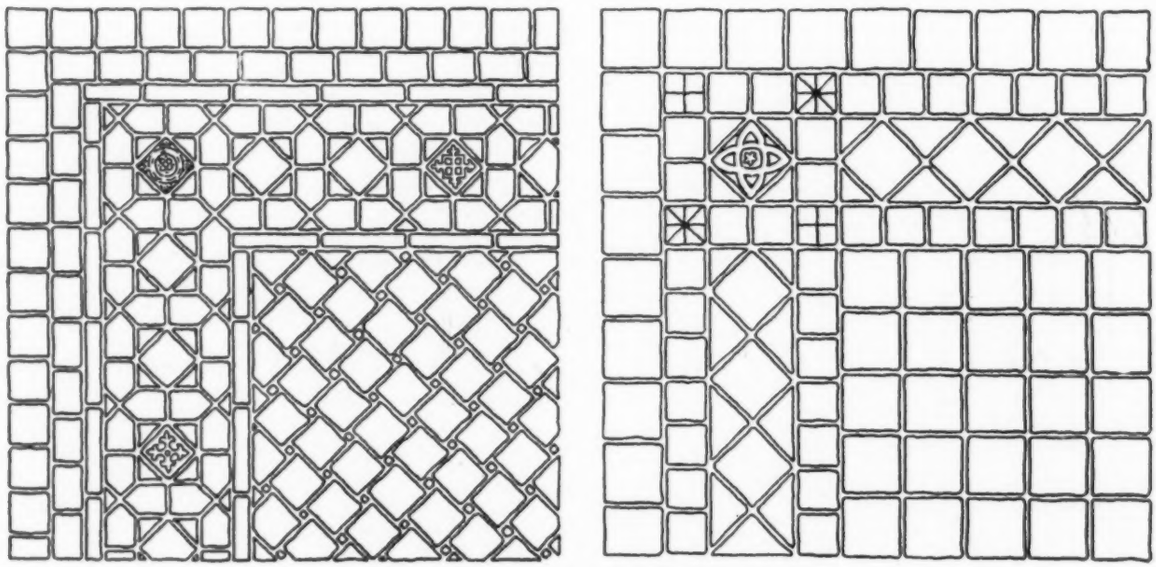
Tile work cannot be conceived without joints, and a rather dark gray natural cement joint is usually best, except for the delicate colors that demand a lighter tone. It is not desirable to match the color of joint and tile, for much of the charm in tile work lies in the play of light and shade in the individual surfaces.

Proper setting of tile depends upon the efficiency of labor, and one of the most serious problems in the tile industry is a shortage of tile-setters, and of those available many are not especially skilled. Architects should do whatever lies in their power to increase the number of workmen and to aid in raising the standard of workmanship.

An illustration of the general misconception of the work of the skilled mechanic is that the ordinary brick mason is a competent fireplace builder. This idea is wrong as there are only a very few masons, aside from the skilled members of the tile-setters, who understand the principles necessary for this work. Theoretically the most perfect form of fireplace is when the width of the back is equal to the depth and the opening is three times the width of the back or the depth. Present conditions require modifications of these rules, but they could be more closely followed in many instances with better results.

Materials that reflect the most and absorb the least heat are the best to use for linings. Iron is among the very worst and fire-clay and brick among the best. The English custom was to plaster and whitewash the brick, white being the best reflector.

Other common misconceptions are those in reference to settlement, proper mixture of stock, floating or buttering wall tile, methods of grouting, crazing, overhead light and cleaning.



Examples of Elaborate Design for Tile Floor and Border

Certain materials other than tile are bound to settle and shift, and tile without elasticity fails to respond except to superior force. For the ordinary wooden construction the 2 by 4 inch should be spaced not over 16 inches on centers and should be braced at the line of the wainscot cap with 2 by 4 inch horizontal bracing. Joists should be braced every six feet with 1 by 3 inch cross bridging. When possible the joists should be lowered to the depth of the tile construction, allowing for a continuous form under the concrete. This form should be of 1-inch boards not over 6 inches wide, laid ¼ inch apart to allow for swelling. Some sort of a light metal binder should be used in the concrete foundation. Concrete should extend under tiled-in tubs and a copper pan or membrane waterproofing provided under shower baths. All tiled-in fixtures, including medicine closets, should be furnished and set by the tile contractor; and the use of wood or all-lead expansion sleeves for fastening fixtures should not be allowed.

Mixtures for the setting are in general as follows:

Concrete should consist of one part Portland cement, two parts sand and four parts gravel, crushed stone or cinders; or of one part cement and five parts coarse sand. Stone or sand concrete over wood construction should be 2 inches thick.

The setting bed for floor tile is usually ½ inch to ¾ inch thick and is mixed one part Portland cement to three parts sand. Over this mixture sprinkle dry cement and tamp the tile into place.

The preparation for tile wall work should always be applied by the tile setter, including the wire lath, when the walls are not of fireproof material.

The mixture for the scratch coat should be one part of cement to two parts of sand, applied not less than ½ inch thick and scratched horizontally. The setting bed for the wall tile should be one part cement to three parts of sand mixed with not over 15 per cent of lime, by volume, well worked in. All wall tile should be soaked for at least twenty minutes in clean water and set while wet.

In setting tile by the method known as "floating" the scratch coat is first applied and when this coat has hardened the wall is soaked, thin strips of lath to act as guides are bedded on, and the float coat applied between these strips. A coating of pure cement mixed to the consistency of thick cream is spread on and the tile beaten into the cement before it starts to set.

In the method of "buttering" wall tile, cement mortar is placed on the back of each tile, and each piece tapped in place separately with the end of the trowel handle.

The success of either method depends upon the skill and honesty of the setter, and proper supervision. The floating method is more commonly used in setting the smaller sized tile, but can be used for all sizes when the backing is rigid. Tile should be floated in small stretches, about 4 feet by 2 feet 6 inches and the mistake of placing tile after the set has started to take place should be avoided.

Objections to buttering are that there is no pure cement next to the tile and that the tile is not entirely bedded, leaving voids at the corners.

Proper grouting of joints has much to do with the life of tile work, especially in connection with ceramic mosaic. The reason is that the edge of this tile is not "fettled" or rubbed off at the factory, and sometimes too much paste is used in papering the tile for setting.

Grouting should be done by experienced men not later than the next morning after each day's work. The joints should be well brushed out, the tile washed with clean water before grouting and no one allowed on floor work for several days after it is completed. To avoid the yellow staining of light colored joints, wall tile should not be grouted for at least a day after it has been set.

Crazing of tile is caused by a combination of manufacturing and setting conditions, for at times the tile are crazed in the original packages, and at other times not until they are in place. Under present methods of manufacture, to quote from another article I have read on this subject, "Crazing is no more detrimental than are a few freckles on a pretty girl's face."

One of the worst conditions that a tile setter has to work under is when the room to be tiled is lighted by skylights or windows with deep reveals. The light exaggerates the least little variation in the thickness of the glaze, and yet a straight edge test will show the wall to be plumb and true. Often when the window shades and curtains are in place this trouble is largely corrected.

Satisfactory cleaning of tile floors depends upon whether the work has been given the proper initial cleaning by the contractor and whether proper instructions have been given in regard to the ordinary household cleaning. Vitreous tile floors can never be kept clean by indifferent applications of cold water, applied with a mop dipped repeatedly into the same bucket of dirty water.

A stiff scouring brush, plenty of clean hot water and a liberal supply of scouring soap or powder are indispensable. Too large a space should not be cleaned at one time and the surface should always be rinsed off with clean hot water.

Semi-vitreous or absorbent tile should be given at least one initial coat of oil or similar treatment under the direction of the tile contractor and further oiling will depend upon the tile used. The softer quarry tile requires several applications before the floor should be used.

Tile of this character should not be scrubbed with soap and hot water, but should be gone over several times each week with a damp mop. Mopping with cold water will help to set the oil polish. Periodically floors of this tile should be treated with a mixture of one pint of raw linseed oil and one bucket of damp sawdust. As the floor is brought to the desired tone less oil will be required. This mixture should be rubbed over the tile and joints with a broom or handful of excelsior, and if applied too

liberally the entire mixture can be removed by washing with strong lye water. Do not expect floors, however well set, to look their best immediately.

Tiles for roofing purposes are manufactured in similar manner to those for floor and wall work. The shale or hard formation of clay, at least for one of the largest roofing tile factories, is cut by a special machine from a local shale pit. This machine mounted on wheels cuts a fifty-foot slice into a side hill and an endless chain of buckets deposits the shale in small open cars, to be taken to the filtering and grinding mill.

A tile roof can be constructed to harmonize in design and shade with any building, and now that slate and other roofing materials have so advanced in price, vitreous terra cotta roofing tiles are rapidly gaining in favor.

Briefly, the arguments in favor of terra cotta roofing tile are their fireproof qualities, a point generally recognized by insurance companies; their non-conductivity to heat and cold, which secures a result directly opposite to that from a roof of slates; their durability and artistic appearance.

In addition to the more common Spanish and French types of roll tile, there are the shingle tile, varying from the plain reds and browns to the rough textured grays and greens. A very interesting recent example of the more artistic shingle tile is their use on the roofs of the Harkness Memorial, Yale University.

Exactly as a fireplace builder is a specialist in his line of work, so should a tile-roofer excel in his work. A roofer familiar with the use of slate is not necessarily familiar with the use of tile. Roofs of tile should be laid by men trained in the line of work and who appreciate the merit of the material.

Any construction that is properly built for slate will carry tile safely and under some conditions no additional strength of framing is required to use tile instead of wood shingles.

It is an interesting fact that the snow-load on a tile roof is from 5 to 10 pounds per square foot less than that on wood shingles. This is due to the fact that the vitreous tile does not hold snow like a damp wood shingle. The total live and dead load carried by the rafters in connection with shingles is 37 to 53 pounds per square foot and for tile 38 to 55 pounds per square foot.

A properly laid tile roof calls for a layer of 40-pound asphalt felt to prevent suction, as well as copper valleys and flashings in connection with the tile.

This felt should be well lapped and laid parallel to the eaves. The use of copper nails to fasten the tile is of vital importance. The special tile against the hip boards should be pointed with elastic cement as well as where they lap each other.

Interior Showing Use of Hand Made Hexagons and Quarry Tile with Plain and Decorated Faience Tile
Richard Arnold Fisher, Architects

Notes from England

THE NATIONAL SHIPYARDS' HOUSING SCHEME AT CHEPSTOW

By H. J. BIRNSTINGL, A.R.I.B.A.

DESIGNED to meet a specific and temporary emergency, most of the additional housing accommodation that was required in different parts of the country during the war was frankly of an ephemeral nature. One of the most notable exceptions to this general rule is the National Shipyards at Chepstow.

At the time when the shipyard was taken over by the British Admiralty it was found that a housing scheme to accommodate 7,500 workers and their families was required, and it was decided to develop some of the existing villages, combining them into a comprehensive town planning scheme. Already a start had been made in the village of Hardwick by private enterprise which provided 267 houses, the architects being Messrs. Dunn, Watson & Curtis Green, and the next village to be undertaken was Bulwarks, planned to contain 1,150 houses and to form a combination with Hardwick, the two villages being connected by paths through the woods.

The situation of these villages is as beautiful as anything in the country. They lie on the southern slope of hills overlooking the broad waters of the Severn and the Wye and full advantage of the natural beauties of the site, with its pleasant prospects, was taken in determining upon the lines of development. An interesting feature about the whole scheme is that all the houses are built of concrete. This is, indeed, the first instance in England where this material has been so extensively used for small buildings. A few years earlier popular prejudice against the employment of this material would have prevented its use on such an extensive scale, but during the war the impossibility of obtaining brick in adequate quantities became a deciding factor in the choice of materials.

A layout plan of Bulwarks village is shown in Fig. 1. It will be seen that the main business center is situated along Thornwell road and in planning the disposition of the buildings a feature has been made of a fine old oak which, protected by a raised bank that covers its roots, is approached by a flight of steps affording an eminence from which a view is obtained along the avenue to the woods beyond. From the avenue a series of axial roads extend, adhering approximately to the contours of the ground. The first of these roads, appropriately called Alpha road, ends with a raised Roman camp surrounded by fine trees. The houses on this road are of the "A," or non-parlor, type, containing a living room, kitchen or scullery, three bedrooms and a bathroom. These houses were the first to be erected and some fifty of them were occupied within

"B" Type Houses at Pennsylvania Village. Fig. 2. Henry E. Farmer, F.R.I.B.A., Architect

"A" Type Houses on Alpha Road, Bulwarks Village. Fig. 5

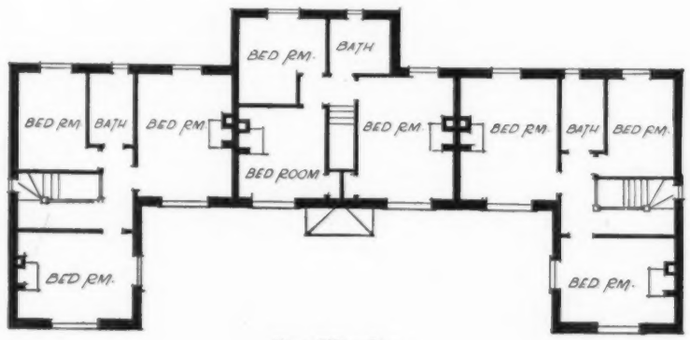
three months from the beginning of the undertaking. A commencement of the "B," or parlor, type was made on Beta road. The avenue terminates in a large, open, circular space in which is a bandstand surrounded by seats. From this point the ground falls away rapidly. The whole arrangement, both architecturally and naturally, is such that it gives a distinguished center to the locality.

The schools are placed in wide, open spaces and in order to economize in road frontage which is, owing to the high costs of road construction, expensive, houses are placed around the schools which are reached by subsidiary paths. The Church of England closes the vista of Church road and beyond, adjoining the woods, are the vicarage grounds. The churches of other religious bodies are suitably disposed in various parts of the village. The best houses are placed with their north elevations facing the camp while to the south a magnificent view is obtained over the Wye and the Severn which lie sixty feet below.

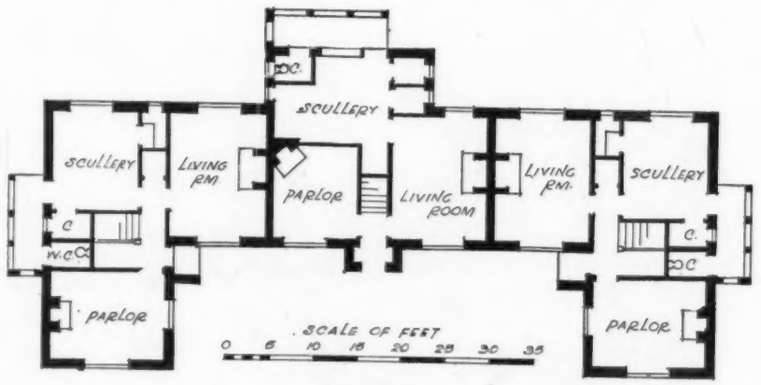
In addition to the villages of Hardwick and Bulwarks the scheme includes Buttington village, composed mainly of "A" type houses which are intended to house, near the plating sheds, the workers who are required to be always at hand. Other villages included in the scheme are Pennsylvania and Sedbury. These are now well in hand. These villages are perhaps more pleasantly situated than those already described, having views of the Wye cliffs and the mellowed walls of Chepstow Castle to the east while at the foot of the village, to the south, can be seen the merging of the two rivers.

In considering the scheme as a whole it was decided to spare the picturesque old village of Chepstow with its tortuous, narrow streets and its port wall and to construct new and wide roads for fast and heavy traffic which would thus be diverted from the narrow Chepstow roads. These new roads would connect up the developed villages on the north and south. This whole scheme is so large in extent that it is difficult to give in a limited space an adequate idea of all that it contains and a few plans and illustrations of some of the completed houses must suffice as an indication of the diversity of treatment that has been adopted.

As has already been said, the difficulty of obtaining brick in sufficient quantity became a determining factor in the choice of materials. Another acute difficulty was transportation and where suitable aggregate and sand are obtainable the transportation can be confined to cement which is approximately one-sixth of the bulk.



Second Floor Plan



First Floor Plan

Three Unit Block of "B" Type House

Therefore the method of concrete construction adopted was that of blocks manufactured on Winget machines. A semi-dry mixture is used with these pressure machines, and the construction is that of the straightforward cavity wall type with iron ties, the inner leaf having a proportion of "breeze" aggregate, avoiding condensation. The continuous cavity successfully excludes the heavy driving rains to which the West of England is subjected. The interior wall surface requires only two coats of plaster and in some cases only a skimming coat is employed. As far as possible the houses are designed to avoid much cutting and to minimize the manufacture of special blocks. For the same reason the doors and windows are standardized to a few types of sashes and casements. It is, of course, inevitable that a certain number of special blocks must be made for chimneys, sills, door hoods and the like, and particular care has been devoted to the designing of these parts.

① SHOPS
② CHURCH
③ INSTITUTE
④ POST OFFICE
⑤ PUBLIC HALL
⑥ CHURCH HALL
⑦ ELEMENTARY SCHOOL
⑧ CINEMA SHOPS
⑨ CO-OP STORES
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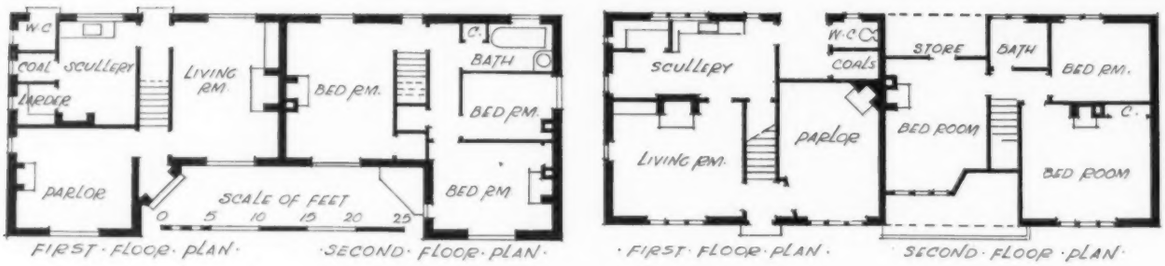


Typical Floor Plans of "B" Type Houses

is moderately small the scale is not lost as is so often the case where too large a block is employed.

A complete contrast with these houses is afforded by those in Fig. 3 which, with their long sweeps of roof line over the doors, have a more rural appearance. Fig. 4 depicts a more formal and classical treatment with elegantly proportioned sash windows and widely overhanging eaves. The paneled stacks, string courses and porches show how much the effect of such buildings may be improved by the judicious use of well designed details. Considered purely on its architectural merits, perhaps, the group most deserving of praise is that shown in Fig. 5. Here is seen all the modest reticence of early nineteenth century work; plain and unpretentious, it is entirely satisfying and yet at the same time it is no dull replica of buildings of a past age; it shows, rather, the adaptation of the old idea to modern requirements. That the unit is not of brick is at once apparent in the bold dentils of the cornice.

An idea of the internal disposition of the rooms may be gathered from the few plans that are shown. In all cases great care has been taken to obtain the best aspects for the various rooms; sunshine is all too scarce. The work at these villages was designed and carried out by Mr. Henry E. Farmer, F. R. I. B. A., until March, 1919, when His Majesty's Office of Works took over the project. There were then some hundreds of houses completed, in addition to most of the roads in Bulwarks and Pennsylvania. The hospital, electric generating station and all the shipyard buildings were also finished and since that time much progress has been made on the whole layout.

The houses in this development may be taken as typical of many that are now being built under the government's housing plans or by various local authorities, many of which are now well advanced. It may, indeed, be said that the housing situation is rapidly improving. It is now less than fifteen months since the Housing Act became law, but already contracts for nearly 200,000 houses have been approved.

A visitor to any one of the villages included in this development will be impressed with the tasteful and attractive appearance which prevails, due to the care of engineers and architects in planning the layout of the villages and the effort to make the houses homelike and livable. This marks a great advance over the usual industrial housing development and the successful result is an encouraging indication of the higher standard of village planning which will develop in the future.

Two "B" Type Blocks at Bulwarks Village. Fig 3. Henry E. Farmer, F.R.I.B.A., Architect

A Modern Swiss Country House

AN INTERESTING ADAPTATION OF ENGLISH PRECEDENT WITH SWISS DETAILS

ERNEST KUHN, ARCHITECT

THE influence of architectural books and periodicals in modifying traditional architectural types is seen in every country. The interchange of ideas which is made so easy by the medium of the press is developing especially in domestic architecture composite types that reflect inspiration from many different national sources. Thus the subject of this article is a country house in Switzerland which is quite distinctly English in its plan arrangement and general exterior composition. There is a sufficient survival of Swiss forms in its details, however, to make it a natural product of a Swiss architect, and it is in this mingling of styles that its special interest lies.

The house is situated on rising ground with an approach to a forecourt on the north side. The principal rooms are given a southern exposure and overlook the garden. The winters in Switzerland are long and a southern exposure is necessary for comfortable interiors. There are no rooms on the third floor and the servants' quarters are grouped on the second floor of the wing.

In arranging the plan the principal rooms on the first floor were given greater height than the others in order to maintain good proportions. The dining room and the southern half of the living hall have this extra height and the second floor is so arranged that the space over this portion of the house is occupied by the owner's suite, consisting of main bedroom, dressing room, bath and child's room. This is reached by three risers and a landing over the start of the main stairs. Note should also be made that a private corridor connects these rooms so that they are a unit independent of guests' and servants' quarters. The servants' rooms are also grouped separately but when necessary, communication with the main part of the second floor is had through the open porch.

The large living hall is divided into two parts by a deep beam supported by square posts, the part near the entrance serving as a reception room. This division is further accentuated by a plaster barrel-vaulted ceiling over the front portion while the remainder of the room has a high, square, wood paneled ceiling.

The interiors are characterized by well detailed paneled walls and ceilings. In the living room the walls are oak and the ceiling, pine stained to match. The upholstery and hangings are figured material in blue and yellow and black. The walls of the front portion are covered with a small figured blue cloth. The entrance hall is a typically Swiss room; the boldly carved wood newel and stair balustrade being the work of a self-taught craftsman who

Second Floor Plan

First Floor Plan

View Entrance Front from Forecourt

View of Typical Bedroom

works in the manner of the medieval workers without drawings. The carved portions are of cherry wood as are also the stiles and rails, the balance of the woodwork of walls and ceilings being pine stained to match the cherry. The walls of the upper hall are rough white plaster. Interesting features of the play room are the miniature stage and antique green tile stove. The floor is linoleum with padded angles ; this play room floor covering is to be removed later on.

The floors throughout the first floor are oak and on the second floor, pine covered with felt and linoleum. The hardware, lighting fixtures and principal furniture were designed by the architect.

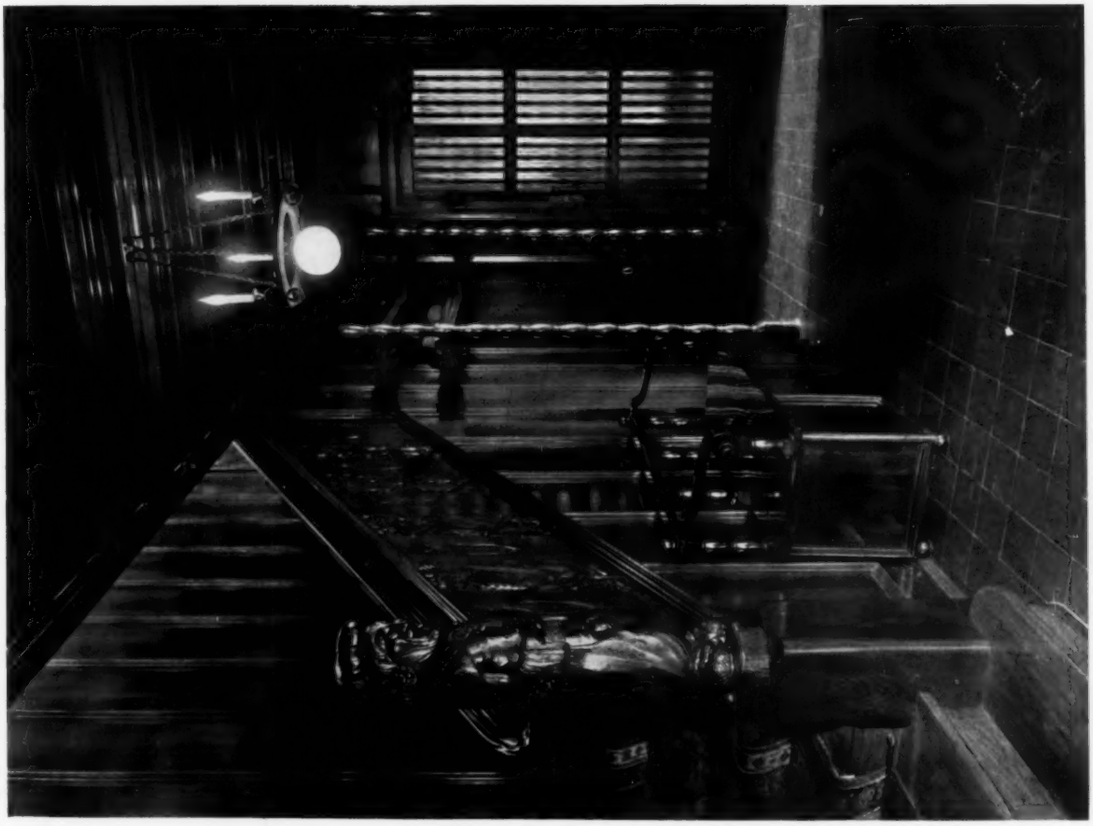
The house walls are built of brick with stucco coating. The Swiss have developed exterior plastering to an efficient degree; it is waterproof and is capable of being worked into mouldings and ornament that stand up surprisingly under severe climate conditions. The first coat is composed of ground sand, cement and lime and in this the rough mouldings when used are worked. This coat is not waterproof. The finishing coat is entirely weatherproof and is composed of a patented mixture in which the color which comes in a wide range is a component part. It is a quick setting cement and is applied to the undercoat to a thickness of only about one-fifth of an inch. It is generally troweled smooth and the mouldings are trued up with a template. The porch columns are artificial stone and the base course also of this material in a red tone.

On the exterior the use of color is depended upon to relieve the severity of the large plaster wall surfaces. The roofs are covered with shingle tile ranging in color from brown to black. The soffit of the

Detail of Living Hall

Detail of Studio

BAY END OF LIVING HALL



STAIR HALL FROM ENTRANCE

ERNEST KUHN, ARCHITECT

Play Room in Service Wing

cornice is brilliant with white rafter ends appearing against red painted roof boards and gutter. This red appears again as the color of the bay window on the garden side and in the doors which are cherry, carved in Swiss patterns. The plaster walls have a pink cast and a narrow band of plaster in white outlines all of the windows. A detail recalling the wood forms

of Swiss peasant buildings is the queerly cut mullions. The windows on the forecourt side and the roof of the bay on the south side have iron grilles that are gilded. Terra cotta is also used for small pieces of decoration at a few points such as in the arch spandrels of the porch and for brackets supporting the beams that carry the overhang of the roof on the wing. These are modeled to represent different grotesque heads similar to the one illustrated.

The wider use of color is a feature of design to which American architects could give greater thought. As a general rule our handling of color is timid, everything is grayed for fear of creating a garish effect, but in stucco buildings particularly bright colors in small areas can be made extremely effective in giving life and vitality to the plain walls. Very often surprisingly successful effects may be had by the simplest use of well chosen colors on such wooden exterior details as window trim and blinds, soffits, cornices and doors.

View of Garden Front

Early American Domestic Architecture

III. THE WARNER HOUSE, NEAR CHESTER, CONN.

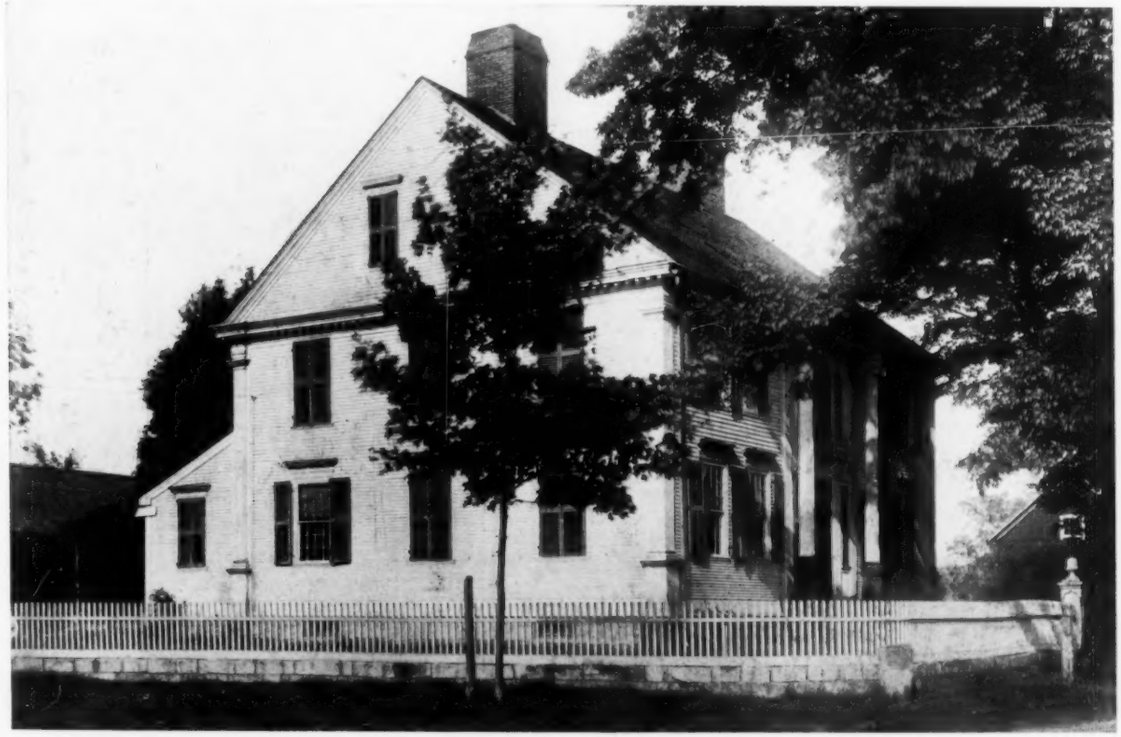
MEASURED DRAWINGS BY J. FREDERICK KELLY

THE work of the early builders of Connecticut during the decade extending from 1790 to 1800 was chiefly characterized by admirable proportions, fineness of scale, and elegance of detail. With but few exceptions, the finest houses of this period are to be found in the Connecticut River valley and its vicinity. It is definitely known that some of these more pretentious houses were entirely constructed and finished throughout by ship-carpenters.

The Warner house, built in 1793, which stands on the west side of the river, a short distance from Chester, and near the old Chester-Hadlyme ferry, is a typical example of the architecture of this period in Connecticut. The name of its designer is not known, but he was evidently possessed of considerable architectural skill, fine taste and a remarkably sensitive feeling for scale and detail. A close examination of both the exterior and interior detail makes it apparent that the designer was either working largely from his memory of classical forms, or departed deliberately from the conventional, especially in the composition of cornice and architrave groups.

In spite of its comparatively late date, this house exhibits very sturdy framing, the vertical posts projecting into the rooms at their corners. The story heights are comparatively high, and this, coupled with the excellent proportions and extremely fine scale of all the interior woodwork, produces an agreeable impression of openness and dignity which is not too cold or formal.

The main façade, largely due to the unusual arrangement of its central motif, is of great charm and interest. The two free-standing columns, of attenuated proportions, flanking the main entrance, and mounted upon superbly cut pedestals of Portland stone, give the house a singular air of grace and elegance. It is highly probable that these two columns originally supported a small pediment of low pitch; for an inspection of the attic displays certain evidence which suggests an alteration at some time subsequent to the original date of building to that part of the roof where this feature would occur. The exterior covering of clapboards laid in courses of graduated exposure is an interesting persistence of an arrangement belonging to a considerably earlier period. The effect produced by the very gradual increase in width of "weather" of each course of clapboards approaching the main cornice is very pleasing, and a decided factor in the scale of the whole exterior.



General View from the Roadway

The Architectural Forum

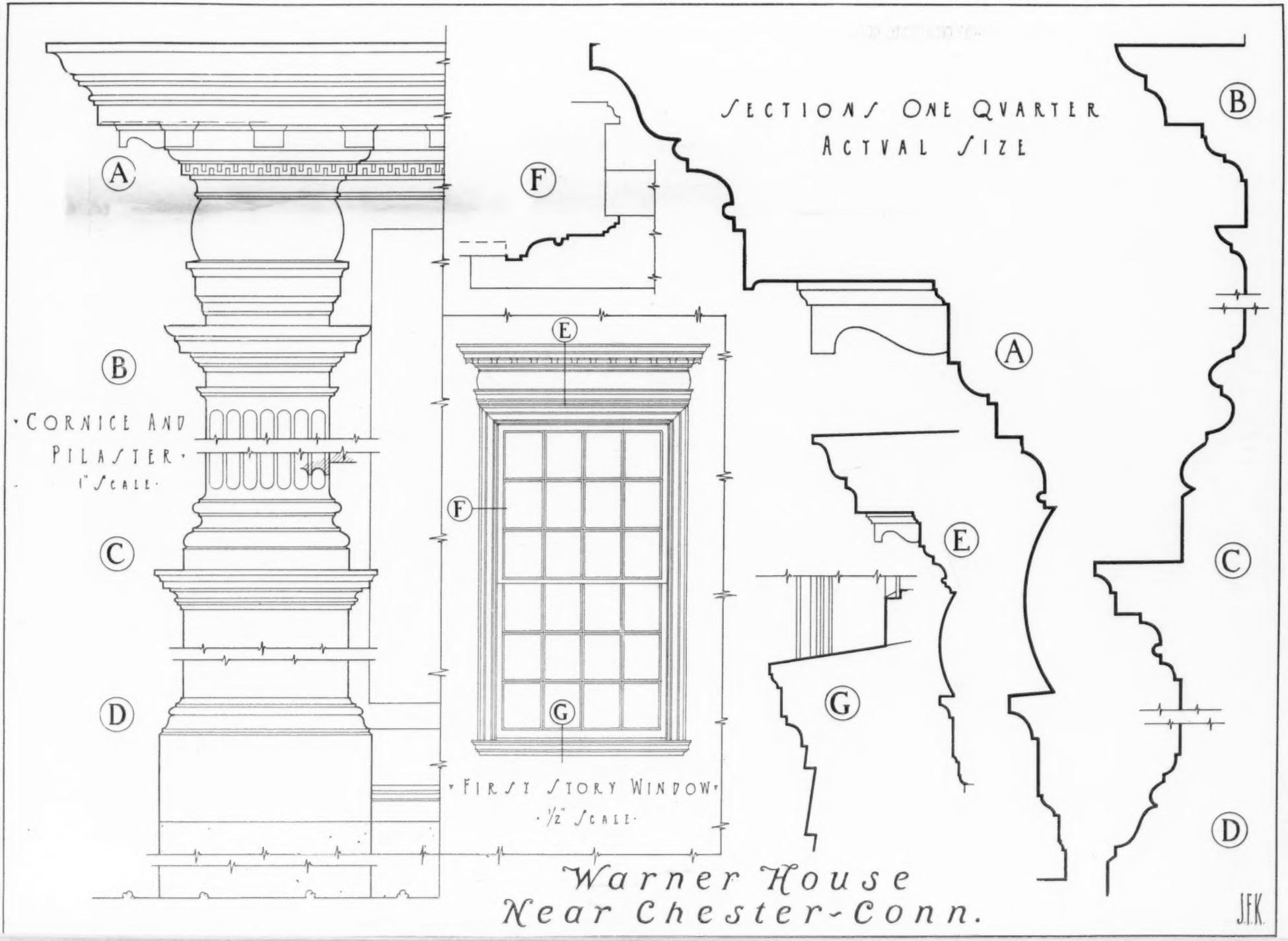
FRONT ELEVATION

SCALE 1/8" = 1-0"

Warner House - Near Chester - Conn.

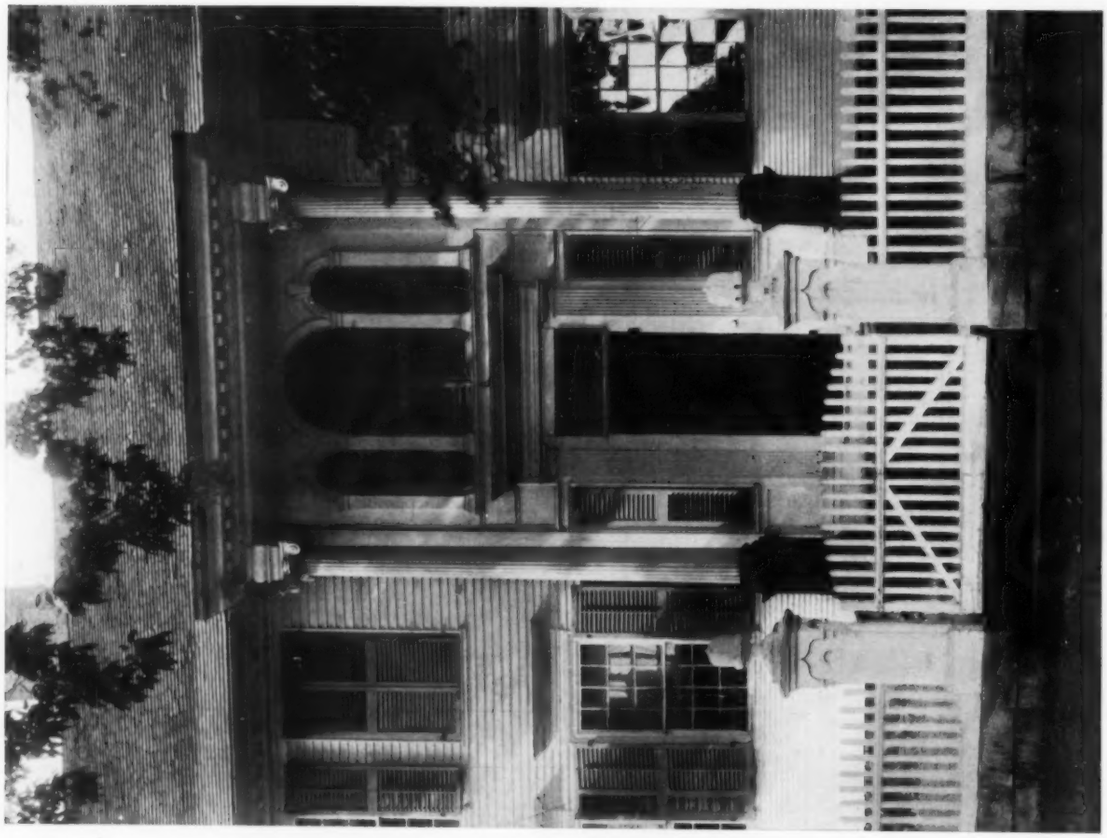
JFK

November, 1920



Warner House
Near Chester-Conn.

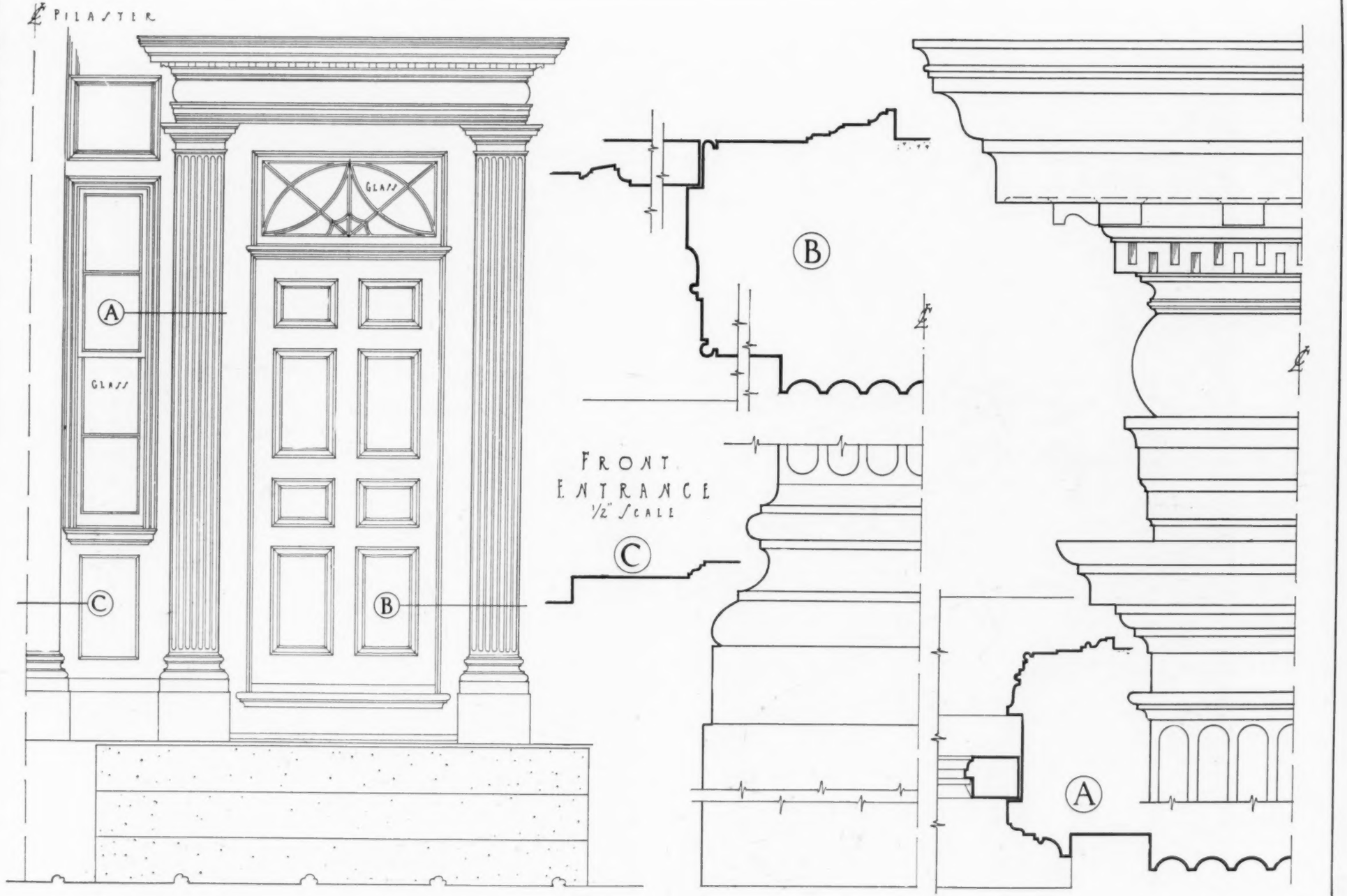
J.F.K.



VIEW OF ENTRANCE PORTICO

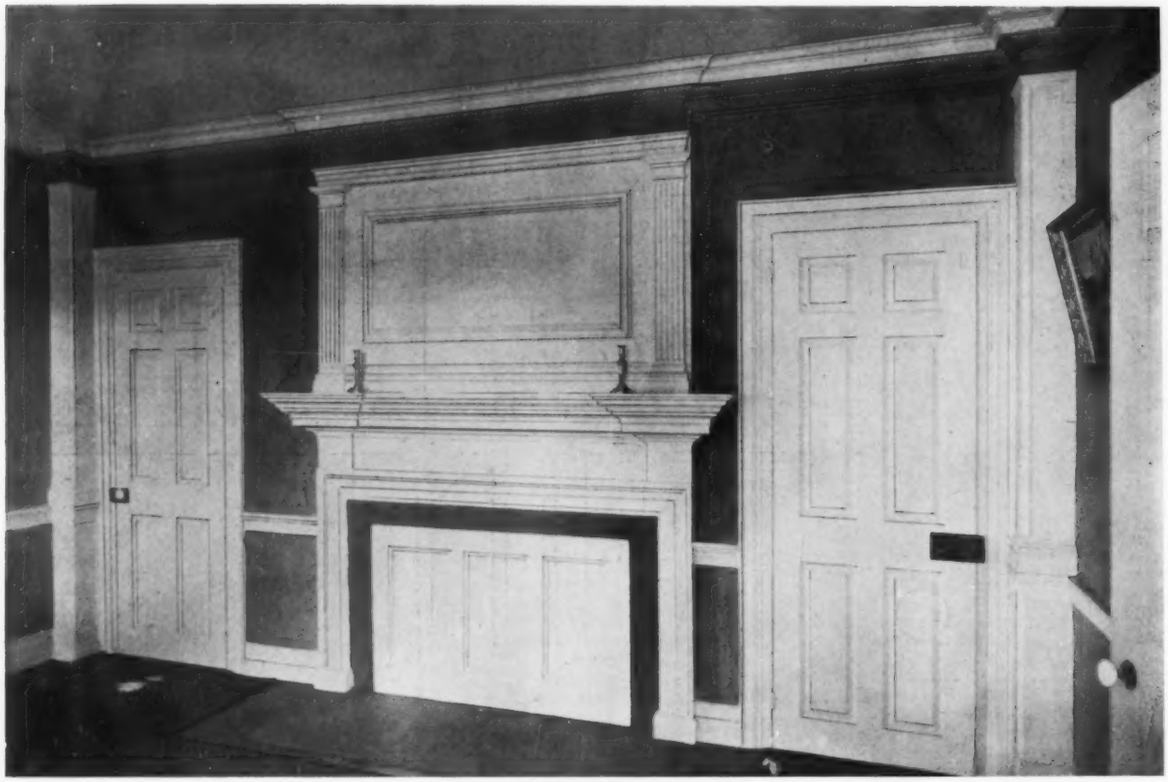
DETAIL OF ENTRANCE DOORWAY

THE WARNER HOUSE, NEAR CHESTER, CONN. BUILT IN 1793

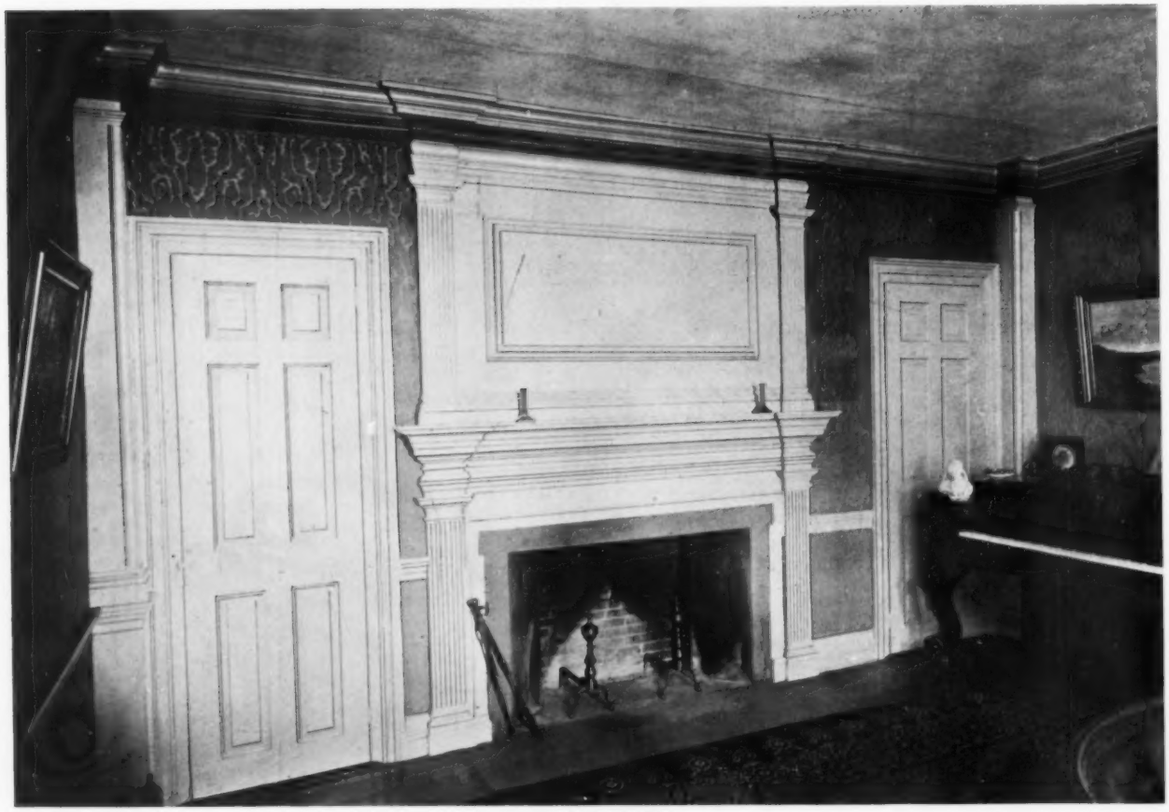


Warner House - Near Chester - Conn.

J.F.K.

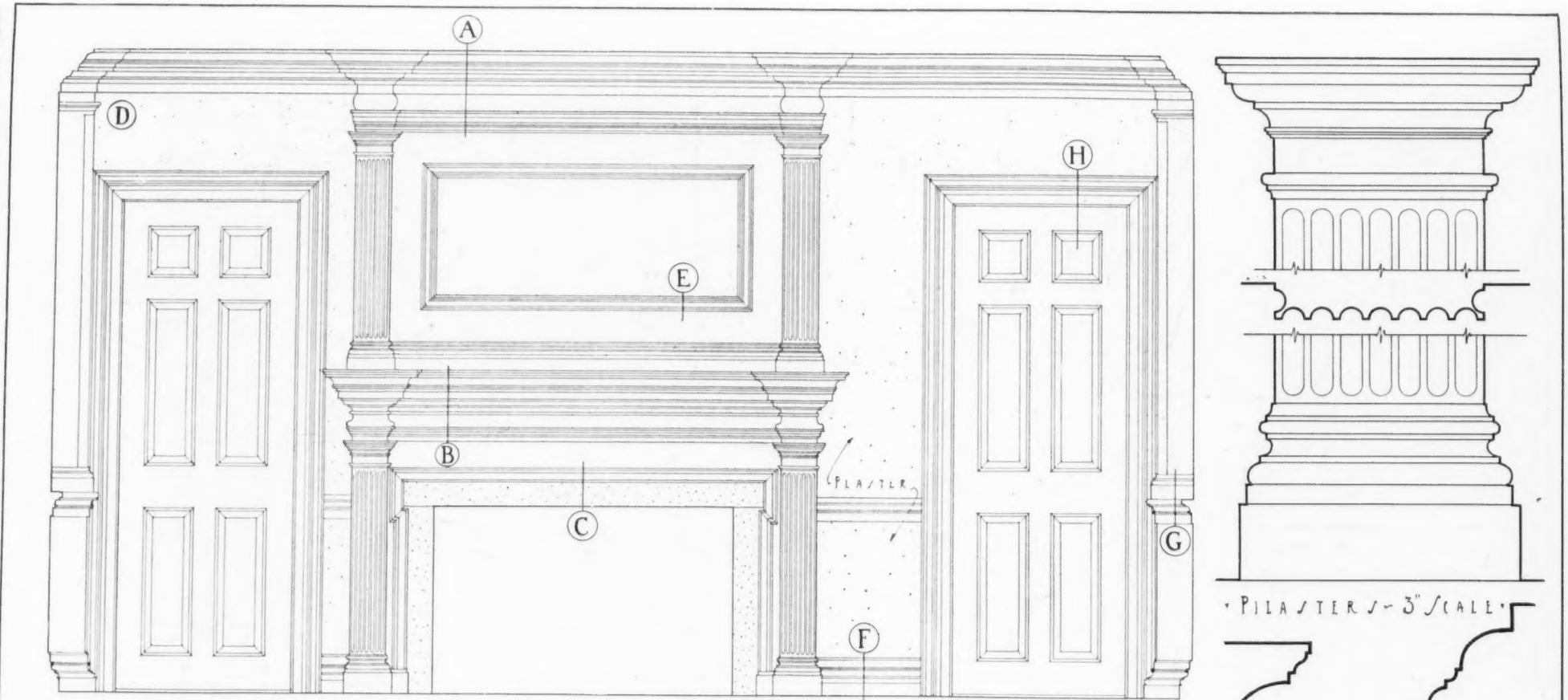


DETAIL OF LIVING ROOM



DETAIL OF PARLOR

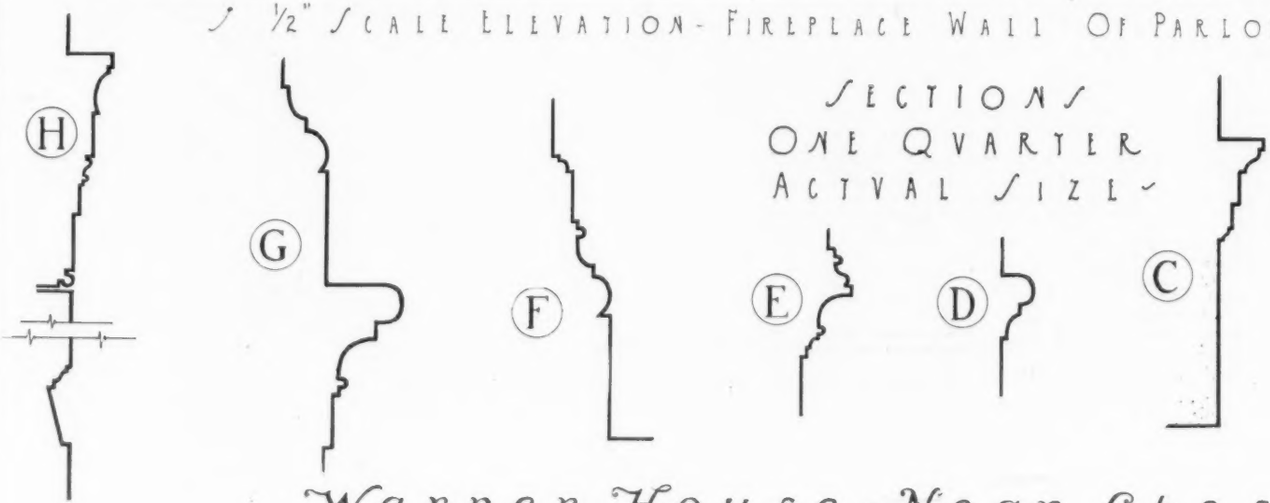
THE WARNER HOUSE, NEAR CHESTER, CONN.

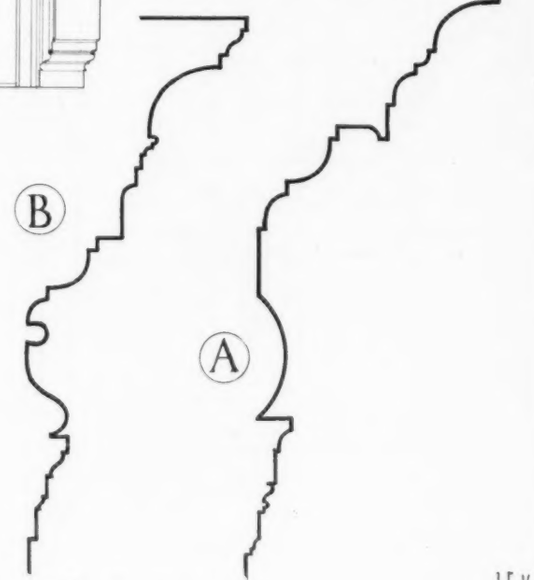


½" SCALE ELEVATION - FIREPLACE WALL OF PARLOR

PILASTER - 3" SCALE

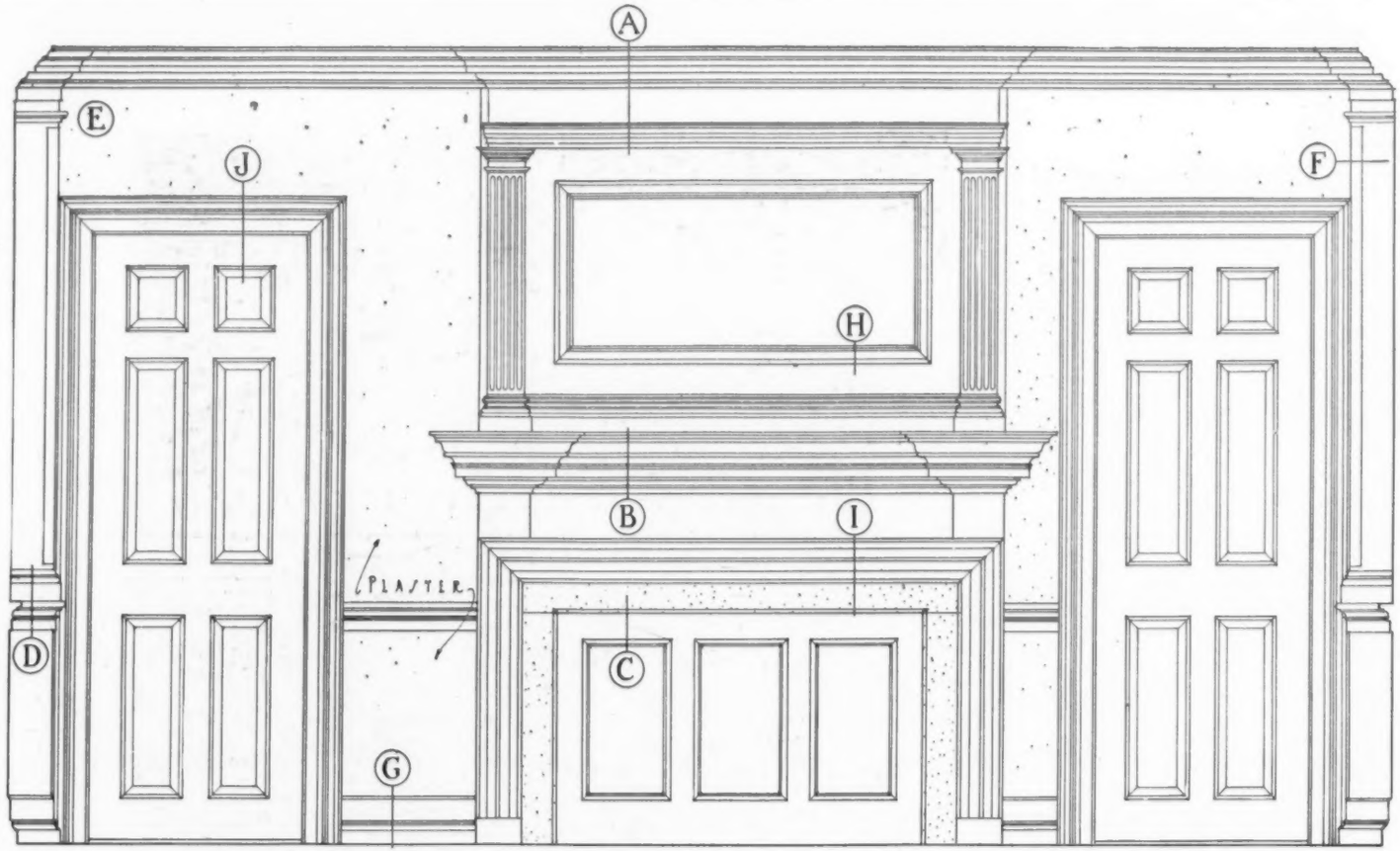
SECTIONS
ONE QUARTER
ACTUAL SIZE



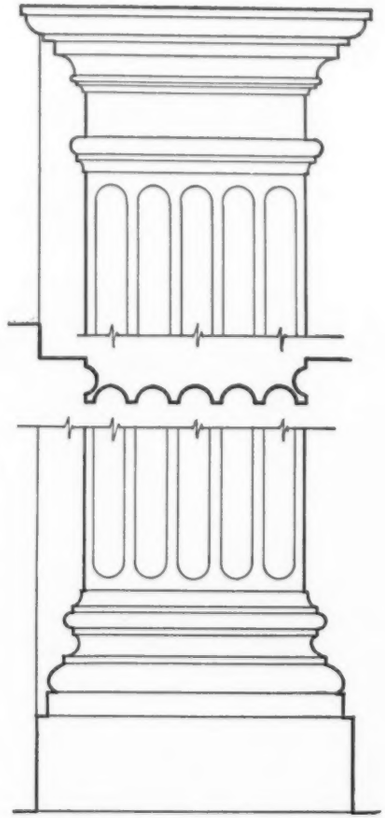


Warner House - Near Chester - Conn.

JFK

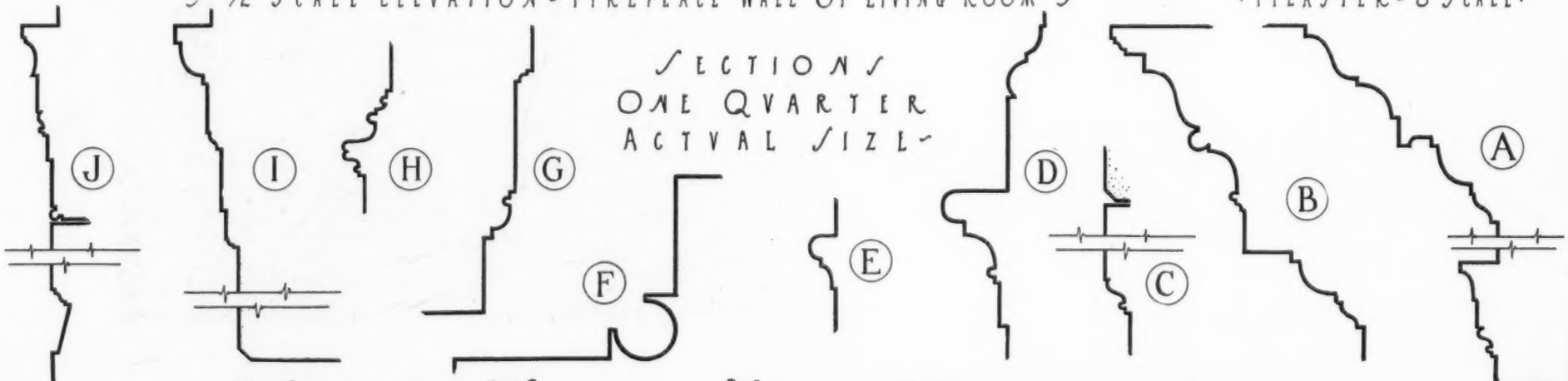


½" SCALE ELEVATION - FIREPLACE WALL OF LIVING ROOM



PILASTER - 3" SCALE

SECTIONS
ONE QUARTER
ACTUAL SIZE



Warner House - Near Chester - Conn.

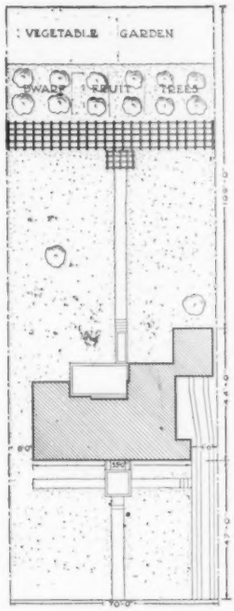
JFK

A House for Practical Convenience

CHARLES Z. KLAUDER, ARCHITECT

THE small house is a problem which comes to the attention of architects more frequently than any other. In many offices it has been looked upon as a necessary evil and as a consequence it was dismissed with the minimum amount of special study in the usually vain hope that there might be a small balance when office expenses were charged against the commission. For a good many years it has had a more or less standard solution and there were few or no reasons to demand anything different.

The high cost of construction today, however, coupled with the expense and difficulty of obtaining servants has brought about a decided change in house planning which requires more detailed consideration of the problem than formerly. It is, furthermore, distinctly an architect's problem—satisfying the present day demand for an artistic home with modern household conveniences in small space and at a moderate cost imposes a burden that none but an experienced and practical designer can meet. The small house problem will undoubtedly increase its demands on architects, and to do the subject justice they should interest themselves in it and charge a fee in proportion to the work involved.



Plot Plan

An example of a successfully planned house in which this procedure has been followed is illustrated herewith. The architect's clients had spent many years in gathering ideas from popular periodicals and other sources and came to him with a host of suggestions which, however, when properly appraised and sorted out, gave the basis of a program from which a most successful servantless house has been built.

The property is a suburban plot with a frontage of 70 feet on the street and a

View of Entrance Front from the Street

DETAIL OF ENTRANCE FRONT

DINING ROOM BAY FROM GARDEN

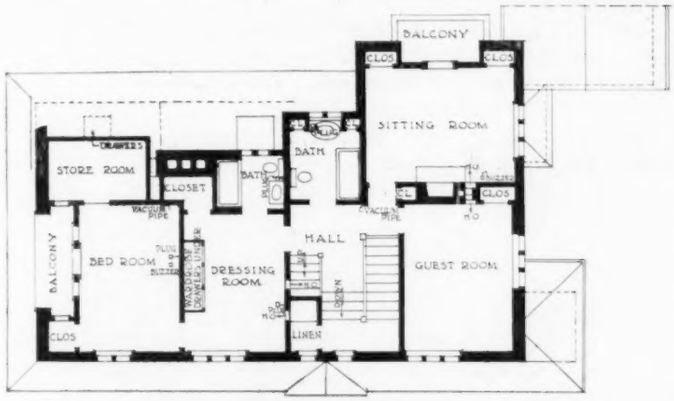
A SMALL HOUSE AT MERCHANTVILLE, N. J.

CHARLES Z. KLAUDER, ARCHITECT

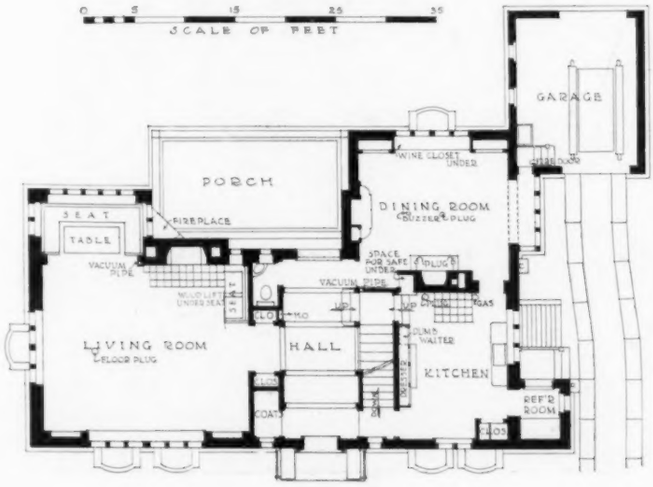
depth of 200 feet. The house was placed 47 feet back from the street, which leaves the larger part of the plot available for a rear garden. The garage has been attached to the house both for convenience and to maintain the garden space undisturbed. Attractive evergreen planting along the base of the house, a hedge that marks the grass terrace and a rustic fence at the street line give a sense of privacy to the house despite its closeness to the street.

The plan is L shaped which provides a square living room with light on three sides and an open paved terrace in the angle overlooking the garden. The house is conducted without any servant, which required the position of the kitchen to be in convenient relation to the other rooms but at the same time to be completely isolated when desired. This room has been placed at the front of the house, affording a pleasant view toward the street; it connects directly with the dining room and with the hall through a lobby near the main entrance and again at the start of the stairs. This arrangement eliminates all extra walking to reach either the entrance or the second floor. There is no pantry, the necessary space for storage of supplies and dishes being provided in a large built-in dresser; a closet with a single door but divided back of it is fitted for keeping brooms and pots. A refrigerator room with drain into the sewage system adjoins the kitchen and serves as a vestibule.

Garage Wing from Garden Terrace



Second Floor Plan



First Floor Plan

In the kitchen are evident some of the features which are designed to reduce household work. Cooking is done by gas and electric ranges; dish washing is also done by an electric machine, the necessary plugs for the connections being at convenient points. A dumb waiter built into the wall dresser gives communication with the laundry below. The hearth on which the ranges set is of quarry tiles and the chimney breast of white enameled brick. The sink is placed at a suitable height to prevent stooping over when working at it and for further convenience a swinging seat is attached to one of the legs. The back of the sink is tiled. A servery built at the side of the chimney breast in the dining room and practically concealed from view in that room enables all materials for a meal to be placed in it from the kitchen. Below it a safe is built in for silver.

In the space under the refrigerator room the gas and electric meters are installed; the entrance to the cellar is through this space and thus the meter room can be left accessible to inspectors when the remainder of the house is closed.

Stairway Showing Door to Kitchen

The garage is reached through a small door inconspicuously placed in the side of the dining room bay. An automatic fire door is provided at this point of communication.

In the dining room an attractive built-in sideboard is a feature. Between the china closets on either side of the windows facing the garden is a wide sill of Tennessee marble with honed finish for plants and below it a wine closet of fair size is arranged.

The living room has a number of flush bookcases and an interesting nook for reading and writing at the left of the fireplace. This has casements on three sides; the table and seats are built-in and the radiation concealed under the seats. The seat at the right of the fireplace conceals a wood lift which connects with the cellar. A hinged top to the seat makes the wood accessible.

The second floor contains an owner's suite of bedroom, dressing room and bath, a sitting room with fireplace and a guest room with a general bathroom opening from the hall. The bathrooms were especially studied for convenience of arrangement and also to give them some element of actual design. The floors and wainscot are of tile; the tubs are built into the wall with concealed piping, the latter, however, available for repairs through small doors inserted in the partitions back of the tubs. The lavatories are placed on higher pedestals than usual to avoid stooping and the windows placed above them.

Other details which were followed to eliminate work in caring for the house were plastering the interior of the cellar walls, a damp course of slate in the exterior walls just above ground level, numerous electric outlets throughout the house for lighting fixtures and electrical appliances, complete piping for vacuum cleaner service, and leaded, outswinging casement windows.

View of House from Garden Pergola

Successful Co-operative Apartment Buildings

By FREDERIC CULVER

DURING the past few months considerable editorial space in THE ARCHITECTURAL FORUM *has been devoted to co-operative building finance. So much interest has been shown in this subject that we have arranged to give additional data prepared by Mr. Frederic Culver, President of Culver & Company, who has had many years of successful experience in the promotion of such projects. This article by Mr. Culver, and other articles to follow, will give definite information based on his experience. Mr. Culver will be glad to answer any general questions on the subject which may be directed to him through the office of* THE FORUM. — *Editors*

IN New York (times being propitious therefor) owners of many older apartment buildings have proceeded to shift the individual ownership of their properties upon the shoulders of a group of those pressed to seek habitations. This has been done under the name and in some cases under the general plan of co-operative ownership of apartment buildings which, to a large extent, had long before been successfully carried into practice in this city.

Such enterprises designed to relieve owners of carrying charges will, in general, violate every principle which should justify the creation of a co-operative apartment organization. In the opinion of the writer great adverse criticism of co-operative apartment organization will result in the future from the unskilled and unstudied movement of the character which has already taken place, and it is to combat the effects of such criticism and to popularize the movement that the writer has been led to publish some interesting facts connected with well considered and successful co-operative apartment developments.

It is safe to assume that no residence designed for individual occupation can be produced or operated as economically as a building of the same character designed for group occupation. When you add to this the many burdens thrown on an individual in the administration of his individual unit, you touch one of the potential causes leading to group living in city and suburban districts. Add to this economies practiced by commercial landlords, want of proper scrutiny of tenants allowed to rent in large buildings, unexpected, inconvenient and inordinate increases of rent and many similar annoyances and you have other causes which impel wise people to turn to group building.

A purchaser of stock in a co-operative building, reflecting the savings derived by quantity production and carrying only a reasonable profit to the promoter-constructor, acquires a habitation suited to his requirements cheaper than it could be produced in any other way. When the operation is concluded the stock should be worth more than it cost. The owner of the stock also enjoys the advantages of co-operative administration, has a voice in the management of the property, can treat his own apartment in any way desired, is forever free from increases of rent and in a comparatively short time amortizes his principal investment through the savings made.

A co-operative apartment building should discard everything which costs money without adding commercial value. All lines and proportions should be used for architectural effect to the exclusion of expensive materials, and the apartments should be completed in the simplest manner possible, leaving the occupant to make his own expenditures on the interior treatment. These features, coupled with a fixed rent for 95 years, make for the economy and pleasure of this type of ownership and occupancy.

The floor plan having been adopted, disinterested real estate experts, with knowledge of local renting values of the district, should be asked to appraise the renting values of the various apartments and on these disinterested opinions of revenue values and expert advice as to operating expenses the whole financial structure should be based. The profits to be made by the promoter-contractor for all services in the conception, planning, financing and erection of the building should in no instance exceed 15 per cent of the total cost, and this should be the only profit in the enterprise; otherwise, in most cases, it will penalize the investor.

After satisfactory title insurance is obtained and a demand for the stock is manifested the enterprise should proceed. The voluntary purchase of the stock of such an enterprise is the justification for its creation. Such an enterprise can safely assure to the owner a return of from 10 to 15 per cent annually on the investment, either in occupation or through sub-letting. Those who promise rent free or benefits more exaggerated than this are treading on dangerous ground although, in the experience of the writer, in a few exceptional cases this has happened. After all, operations of this character can only be successful in a large way when the investing public has confidence in the ability and integrity of the promoter and the knowledge that the profits are

Apartment Building on East 66th Street, New York

moderate and that the investor has the benefits of a mass production.

Co-operative apartment enterprises are bound to live and increase in number. When well conceived and executed their merits are not to be disputed, but the ability of the investor to sell at any time is a very necessary condition, and this can be satisfactorily accomplished only when full market value is given the original investor. In addition to this, the organization which has produced any such enterprise must give the assistance of its selling force to any patron who desires to dispose of his holdings.

Groups of such prospective tenant-owners are formed usually in one of two ways: either by their own association, determining on a site and a price they can pay, or by the action of a promotive constructor bringing such a group together. The action cannot be speculative. The demand for the operation must precede its creation.

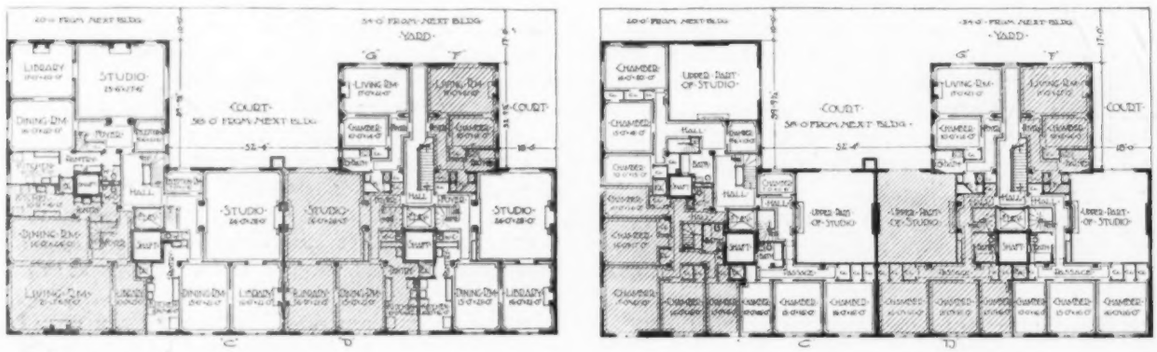
The best of skill should be displayed in the selection of a site which will probably increase in value and having, so far as possible, good surroundings and the advantages of light, and in its acquisition at a price not exceeding its fair and reasonable value. The same skill must be displayed in planning the types of the various units of apartments to be produced.

The crux of the whole transaction, however, is whether the appraised commercial renting values fixed on the various apartments by disinterested experts will show a proper saving to the tenant-owners. If, on this appraisal, the cost of the operation is too great, the enterprise should be abandoned.

The service profits on one of these co-operative enterprises should, for *all* services including building profits, law, architectural, promotion and selling, not be so great as to place a burden on the co-operators which will manifest itself in depreciated value of their securities. There is here no legitimate field for promotion *per se* or which promises the impossible and takes out of the enterprise a compensation which can in no way be justified.

Readers of this article will undoubtedly be interested in a few facts and figures regarding several successful co-operative apartment buildings which have been developed in New York during the past 15 years.

Nos. 131–135 East 66th Street—On plot of 170 feet front by 100 feet deep is this 11-story fireproof building of which Charles A. Platt is the architect, completed in 1907. This property cost the co-operators $890,000, represented by $308,000 of stock and $582,000 of mortgage. The unit blocks of stock were $16,000 and $18,000. The rents of



Plan of Typical Main and Typical Mezzanine Floor, Apartment Building on East 66th Street, New York
Charles A. Platt, Architect

apartments in the proposed building were appraised at from $3,200 to $5,000. On these rentals the enterprise saved the co-operators from the start over 12 per cent annually on their investment and in 1920, due to increased rent values, about 25 per cent on their original investments. The building is worth today not less than $2,000,000. Blocks of stock sold before the war for about $35,000 and are now sought at $50,000. In this operation good judgment was displayed in the selection and purchase of the site; the building is large and its management has been good.

No. 925 Park Avenue is on a plot 100 feet by 100 feet at Park avenue and 80th street and was planned by Delano & Aldrich. Blocks of stock in this building were originally sold for from $20,000 to $24,000 which can be had today for not less than $60,000. The saving to stockholders has always been from 12 to 16 per cent annually before the war and the writer estimates that these savings are now about 25 to 30 per cent. The same care as to selection and purchase of site and management has been shown in this enterprise as in the instance previously noted.

50 West 67th Street—The promotive and building profit on this building, of which Shape & Bready, Inc., are architects, was figured very low and as a result the building was produced at a loss to the builders. The writer is advised by a tenant-owner that he is living in the building rent free save for the interest on his investment. This interest is a sum which is a very small proportion of the commercial value of the rent of the apartment occupied by each tenant-owner.

These examples could be multiplied but it suffices to say that on the statistics gathered in 1916 by the writer from the owners of several million dollars' worth of successful co-operative apartment buildings in New York, covering a period of years, the average saving to tenant-owners amounted to 14 per cent on the aggregate investment.

Experience has shown that a definite plan and method of developing any co-operative building project must be worked out in careful detail. In view of this fact it is necessary to know definitely the ultimate cost, renting values, maintenance charges and similar figures required in developing a proper prospectus for the operation.

Apartment Building at 563 Park Avenue, New York
Walter B. Chambers, Architect

Apartment Building at 863 Park Avenue, New York
Charles A. Platt, Architect

The Placing of a Cost-Plus Building Contract

I. OBTAINING BIDS AND SELECTING THE CONTRACTOR

SOME tendency is now noticeable toward a return to the old method of fixed-price bidding by contractors. At the same time it is apparent that a great proportion of the construction work to be done in the next year or two — particularly on larger projects — will be done under some kind of cost-plus contractual relationship. When a building contract is made on a cost-plus basis the architect retained to carry out plans and supervision has placed upon him a great responsibility in protecting the owner's interests. This is the first of two articles which will point out important factors and methods involved in placing contracts on this basis. The second article, which will appear in the December issue of THE FORUM, *will be entitled, "Necessary Organization and Methods for Supervision." — EDITORS*

THE definite responsibility placed upon an architect who, in behalf of his client, arranges any type of cost plus contract for building construction is so evident that it requires little discussion. Regardless of safeguards, a cost-plus contract of any nature offers certain possibilities of exceeding cost estimates which must be met through careful supervision on the part of the architect. It is assumed that the average owner who is investing his money in a building is not competent to check the expenditures in work of the contractor and in many instances the architect is called upon to render this important service. It is evident, therefore, that an architect rendering service of this nature must be equipped with a good business knowledge of actual conditions in the building field and that he must have, through personal capacity or on the part of personnel in his organization, such necessary and practical forces of supervision as will provide a definite check, not only on expenditures but on their efficiency and on the quality of workmanship and materials put into the building.

Removing Elements of Risk

Sufficient thought and experience have developed the fact that the straight cost-plus contract is not advisable under any circumstances. This fact is well understood by good contractors, as shown by the type of advertising done by large contracting organizations and by the methods used in selling their services to the architect and to the owner.

A careful analysis of the results of existing and recent contracts shows rather definitely that the best form of contract so far devised is what is known as the cost-plus-fixed-fee contract with penalty and bonus clause; and it would seem that the architect can safely recommend this form—a contract fair and acceptable to the contractor and affording a definite measure of protection to the owner.

The development of this type of contract may be briefly described as follows:

1–Complete plans and specifications are prepared by the architect.

2–A carefully detailed estimate of necessary labor and amount of material is made by the contractor and submitted to the architect, together with a statement of available materials and all the definite sub-contractors figures.

3–On a basis of the total of the costs of labor and material the contractor estimates a lump sum as his profit, this being known as the fixed fee.

4–The contractor agrees to a penalty and bonus clause through the operation of which his fixed profit fluctuates according to the relation of the final cost of labor and materials to the original estimate.

The first important point is to fix the fee which a builder is to receive for carrying out the work. This is usually done by having prepared a carefully estimated cost and the fee determined at a rate varying from 7 to 10 per cent of its figure. This definite amount is to be the contractor's payment for expert service. Many reputable contractors go further than fixing the fee, to the extent that they are willing to introduce a penalty and bonus clause. This is worked out by various methods, one of the better methods being an agreement by which this fixed fee is increased or reduced in proportion to the amount of saving or over-run on the estimated cost. Some contractors are accepting work on a basis whereby they agree to bear one-half the excess cost. The exact details of the cost-plus arrangement are therefore matters of agreement among owner, architect and contractor, but the important feature lies in definitely fixing in advance the contractor's profit and in penalizing him in some manner for excess cost.

The next important question is the possibility of placing cost-plus work through the medium of bids received from contractors. Considering several contracts which have been recently placed in this manner, it is quite evident that contractors may be asked to bid on cost-plus work without the responsibility attached to a bid placed in the usual fixed-price method. To do this the architect prepares his working drawings and specifications and invites several reputable contracting firms to place bids in accordance with a list of requirements attached. These requirements in general may be:

(1) That the contractor is willing to work under a fixed fee, bonus and penalty type of contract as selected by the architect.

(2) That the contractor will carefully estimate the costs, getting figures from sub-contractors and material dealers to cover the major portions of the work, and submit these figures as part of the bid.

(3) That the contractor is willing to allow close supervision by the architect's office, and that he will file with the architect regularly during the course of the construction such definite information as may be required to check the work.

(4) That wherever the owner or architect finds it possible to obtain lower sub-contract or material figures than those contained in the contractor's bid, these may be substituted to provide a saving for the owner.

Having invited several contractors to bid under such conditions as may be imposed through some such schedule as that outlined, bids will be received in due course and the question of what contractor is to be awarded the work may be definitely settled. There will, of course, be several important points for consideration in examining the bids made by various contractors. The first of these is the fixed amount asked by the contractor for carrying out the work. The second is the cost of the work as estimated by each contractor. The third is the general experience and reputation borne by a contractor as an important factor to be considered in relation to the bid which he makes. It is evident that selection will not be made because of the lowest fee or the lowest estimated cost, nor always because one contractor may bear a better reputation than another. An important point involved is the judgment and analysis by the architect. Upon examining the bid which shows the lowest cost figure, it may be found that certain portions of the work have not been estimated. It is evident, therefore, that the architect should carry out an independent quantity survey and estimate in order that the bids may be quickly checked. Further examination of the bid will show in general the quality of material which the contractor proposes purchasing, together with the class of sub-contractors whom he proposes to employ. Evidently, the fairest manner in which the contract can be awarded is to give due consideration, first, to the practical manner in which the estimate has been made, and then to the standing and experience of the individual contractor. While one contractor may be willing to work for 7 per cent of the estimated cost, the employment of one who asks 9 per cent for his services may prove advisable, if he is undertaking the work in a businesslike manner which promises to show a definite saving on construction cost for the owner.

The very act of passing upon the bids received in the process of letting work on a cost-plus basis imposes great responsibility on the architect who may be called upon to advise an owner in this connection. Any architect who has had actual field experience and who is closely in contact with conditions in the material and labor markets is in a position to render good service in this connection. If the architect himself is too busy or not equipped for the details of such supervision it is evident that he must have a properly trained member of his organization, able to talk directly to the building contractor in a manner which only familiarity with construction conditions and actual experience in the field can develop.

It should be realized—as will be more specifically explained in the next section of this article—that supervision must not be so impractical or so close that the contractor is hampered in carrying out the work which he undertakes. The relationship between the architect and the average building contractor is at best strained because of different view points. Frankly, the average building contractor is not often favorably impressed with the architect. This fact is undoubtedly due to lack of co-operation on a proper and businesslike basis in the interests of the owner. We must admit that this condition is often the fault of the architect because he designs his building and draws up his specifications without consulting a practical builder when he has not the direct experience and knowledge requisite for actual field application.

This brings out the fact that the architect who places the cost-plus contract for an owner must expect to maintain daily and intimate contact with the work as it proceeds. He will be called upon to approve all purchase orders and payroll expenditures. The responsibility for the selection of materials is placed entirely upon his shoulders. He will have direct relationship with sub-contractors because they have been retained under his approval and often by his direction. In the selection of a contractor who is to do the work, therefore, it is not simply a question of selecting a large contracting organization known for the volume and merit of its work, but the architect should insist on some knowledge of the personnel of the field force which the particular contractor expects to employ. The contractor undoubtedly has in mind some individual who will be field superintendent and it is well to check up the records of the man or men who will deal directly with the architect.

It might be remembered, also, that the size of a contractor's organization is not always important; often large contracting firms will have more work than is justifiable, while some smaller organization having a personnel of experienced builders is seeking work and is willing to do it on a basis of reasonable profit. The architect's judgment in selecting the contractor is therefore called upon to weigh the insight, ability and standard of each contractor, often in the light of past experience, and not only of the organization but of its representatives who will be placed directly upon the work in question.

"Selling" Architecture to the Man on the Street

MANUFACTURERS' PUBLICITY INDICATES VALUE OF ARCHITECTURAL SERVICE

By S. HOWARD MYERS

DURING the past two years there has been much heated discussion on the subject of architectural advertising. Opinions have been freely given for and against a program of education to develop a more fundamental and widespread appreciation of the value of architectural service. Up to the present nothing of a definite nature has been done by architects in the United States except in a few isolated, local cases.

It has remained for a number of manufacturers prominently identified with the building industry to take the first step in driving home to the man on the street through the medium of advertising that better building can result only through the larger use of the services of architects.

Two advertising campaigns which are now in progress in magazines of popular circulation are of particular interest to the profession. One is the advertising of an individual manufacturer whose product is of a utility type; the other is the advertising of a group of manufacturers representing an industry which produces a material largely used for its æsthetic qualities.

The Architect and the Electrical Contractor
HABIRSHAW
"Proven by the test of time"
Insulated Wire & Cable
Plus Western Electric Company's Service

Selling to the Public the Business Value of Architectural Service
An Advertisement in *The Saturday Evening Post*

The campaign of the National Terra Cotta Society which opened in a recent issue of *The Literary Digest* offers a splendid example of how, through instructive educational publicity, the public can be interested in architecture—a subject which heretofore, unfortunately for the profession, has been a closed book to hundreds of thousands of building owners of the present and of the future.

The advertisement reproduced on the opposite page shows how a dramatic presentation of the Woolworth Building has been featured to win the reader's attention. Several paragraphs of the text are of sufficient interest to be quoted:

"When next you're downtown in New York, go out of your way to look again at the Woolworth Building. Look at it through new eyes!

"From that moment on you will make up your mind that when you look at buildings you will see Architecture.

"What is Architecture?

"It is Style. It is Design. It is Engineering. It is Mass and it is Detail. It is Proportion and it is Scale. It is Plan and it is Decoration. It is Ornament and it is Color.

"It is many things all co-ordinated by the master-mind of the architect."

Another striking feature of this unusual advertisement, from the architect's point of view, is what might be called the Brief Course in Architecture which is to be continued throughout the campaign. In each advertisement architectural details will be illustrated and described simply.

The benefit to be derived by the profession from this advertising is obvious. If the public can be taught to think of a building in terms of architecture—to ask the name of the architect rather than the name of the owner—then surely a great and larger future has been opened for the profession which will benefit public and architect alike.

Another campaign of equal interest is that of the Habirshaw Electric Cable Company. This concern has for several years devoted a major part of its advertising effort to establishing in the public mind the proper relation which should exist between building owner, architect and contractor. The advertisement reproduced is typical of this series.

Through such advertising a background of confidence is built up which enables the several factors participating in any important building operation to function in their best capacities.

Advertising developed in such ways will certainly influence a change in the policy of some manufacturers whose chief concern seems to have been to discredit the architect and to attempt to force the sale of their products to prospective building owners without recognizing the architect's professional function as adviser to his clients.

The possibility does not seem entirely remote that many architects whose attitude towards advertising has in the past been at best apathetic will be moved to consider seriously whether the force of honest, dignified advertising could not be applied to the profession of architecture with the purpose of establishing it on the most substantial basis.

Banker's Analysis Shows Active Period of Construction Coming

THE National City Bank, in its November review of business conditions, asserts that there is no good reason for believing that the country is entering a long period of depression. Referring to the great slump of commodity prices and the stagnation which has developed in some lines, this financial review says:

"Such experiences in the past have always followed long periods of internal development, including extensive construction work, such as railroad building, town building, etc. Our periods of prosperity and credit expansion have been of this character and it has usually happened that the movement has over-run the needs of the country at the time, and a period of growth was required afterward to bring the country up to its new facilities. This was the case in 1873 and 1893, the two most important crises of our recent history. In the period following 1893 recovery was delayed by controversy over the money question.

"The boom period which has been responsible for the existing expansion of credit and high prices was not due to internal development or construction work; on the contrary, it interfered with normal development and improvements and the facilities of the country are behind its needs. Never before was there so much work in sight needing to be done, or so many opportunities in the world outside. The immediate problem is that of price readjustment. It is not a case of exhaustion or of waiting to grow up to investments that have been made.

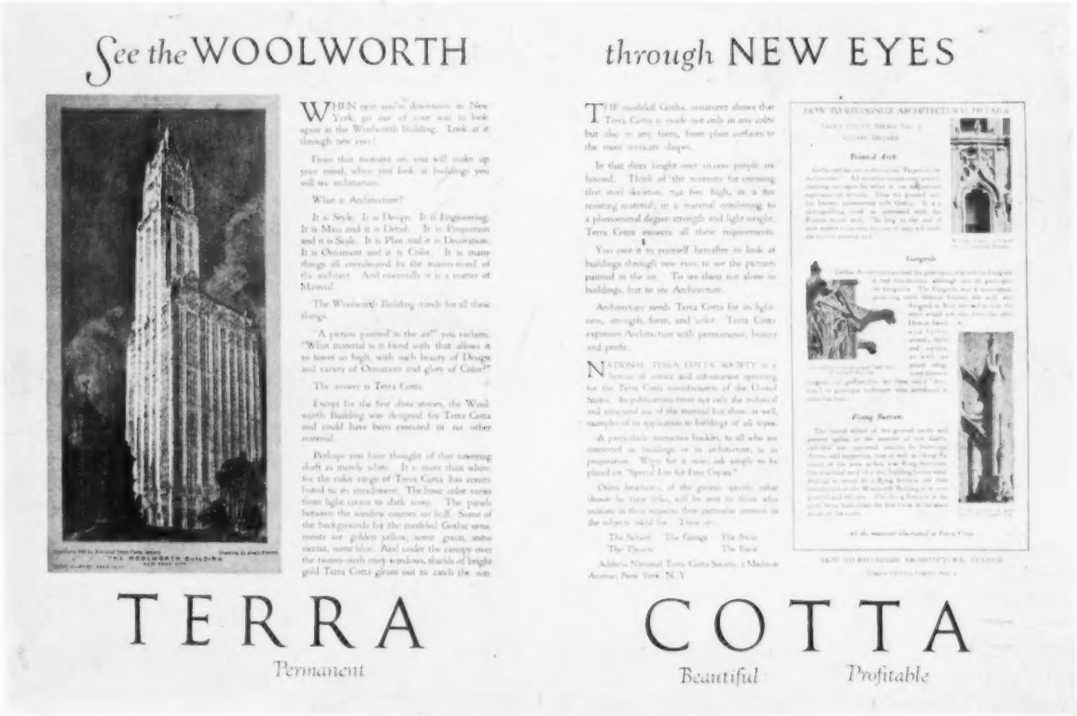
"The reserve resources and recuperative powers of the country are far greater than at any previous time when a check of this kind was experienced. The credit situation is wholly different, which in itself is a factor of great importance."

An additional viewpoint is given by the Dow Service Building Reports:

"It is conservative to assume that once the prospective building horizon is cleared the building construction public, or that part of it that can finance its own way without depending upon the aid of the recognized lending institutions, will rush into the market with new projects. By that time there will be more jokeless workmen; building material manufacturers will have had an opportunity to catch up with the backlog orders and non-deliveries and the cost of production of materials will have been drawn nearer to a normal basis.

"It must be remembered, however, that there is nowhere in the building industry a large surplus of building material supplies.

"Couple this condition of building material supply with a prospective stampede to anticipate the more or less experimental application of new laws as applied to construction in all its details, and at the same time bearing in mind the application of recent attempts to legislate for or against building construction, and it becomes apparent that building material prices have not yet come down to stay."



Developing a More Extensive Public Appreciation of Architecture
A Two-page Advertisement in *The Literary Digest*, Oct. 23, 1920

EDITORIAL COMMENT

WHAT SHOULD ARCHITECTS ADVISE REGARDING CONSTRUCTION?

THE professional capacity of the architect often requires him to take a position which is not advantageous to his pecuniary profit. This circumstance, which is so unusual in the business world, has probably never been so greatly in evidence as during the past year when the building industry was completely hemmed in by unfavorable conditions. The architect has been constantly asked his advice as to when to build and it is to the great credit of the profession that the average architect has displayed real professional qualities and has not encouraged clients to undertake building under uncertain conditions except in those cases, which have been numerous, where the estimate of immediate financial return from buildings has been sufficient to warrant the expenditure.

The profession in generally adopting this sane policy has undoubtedly deprived itself of many commissions, but it can take comfort in realizing that it has lived up to professional standards under conditions which presented great temptations and can rest assured that its action has greatly strengthened its position which will undoubtedly be borne out by future events.

The architect must exercise as well, however, a positive function; if it is unselfish service for him to advise against building, it is of equal service to anticipate future conditions as far as present facts permit, so that he may advise when the time for building will be favorable.

Cost of construction that may be high in comparison with figures that obtained before the war is not necessarily a detriment to building, but the lack of stabilization in every element entering into construction is a serious hindrance and this has been the primary difficulty. There is now, fortunately, evidence that this condition will be soon remedied.

Unquestionably the most disturbing factor has been the unreliability of labor. Excessive demand, during and immediately following the war, gave an opportunity for arbitrary wages and "loafing on the job" which resulted in a great decrease in efficiency. With the prospect of real deflation taking place and the certainty of wide unemployment if the present building inactivity continues, labor leaders have begun to see light. Building labor in Chicago has recently made an agreement to refrain from demanding higher wages for one year and has also agreed to arbitrate all jurisdictional disputes in order to eliminate the loss of valuable time.

From Baltimore comes the report that building trades workmen have declined an increase in wages which a previous trade agreement called for at this time. The rate for carpenters had been 90 cents an hour and on November first a rate of $1 an hour was to take effect. The result of further increases in wages was sufficiently obvious to them to make it appear desirable to abide by the existing wage.

These observations are indicative of a realization on the part of labor that construction costs must be stabilized and an increase in production brought about if a period of unemployment is to be averted. The labor unions, which during the last few years have ruled worker, employer and public with an iron hand, are now on the defensive, and unless they soon show a decided change in attitude they will go down in defeat. The present investigation into building practices in New York is bringing to light some instances of the use of the most revolting methods on the part of labor leaders in extorting large sums of money from builders and owners as protection against strikes that are called at the pleasure of the labor leaders and without a pretext of excuse.

It is undeniable that some form of collective action is necessary in the complex modern business world in order to insure fair and just treatment of workers, but it is equally certain that any system which permits dishonest leaders to use gullible workmen as a pawn to extort fortunes for their private gain will not be countenanced. Labor must rid itself of these vultures. The publicity these methods are receiving will be effective in eliminating many abuses and should aid materially in bringing about greater production and lower unit costs.

In view of all present indications architects should advise clients to make all preparations for beginning construction with the opening of the next building season. Labor costs will, in the next few months, be stabilized and the desire to have employment will guarantee efficiency.

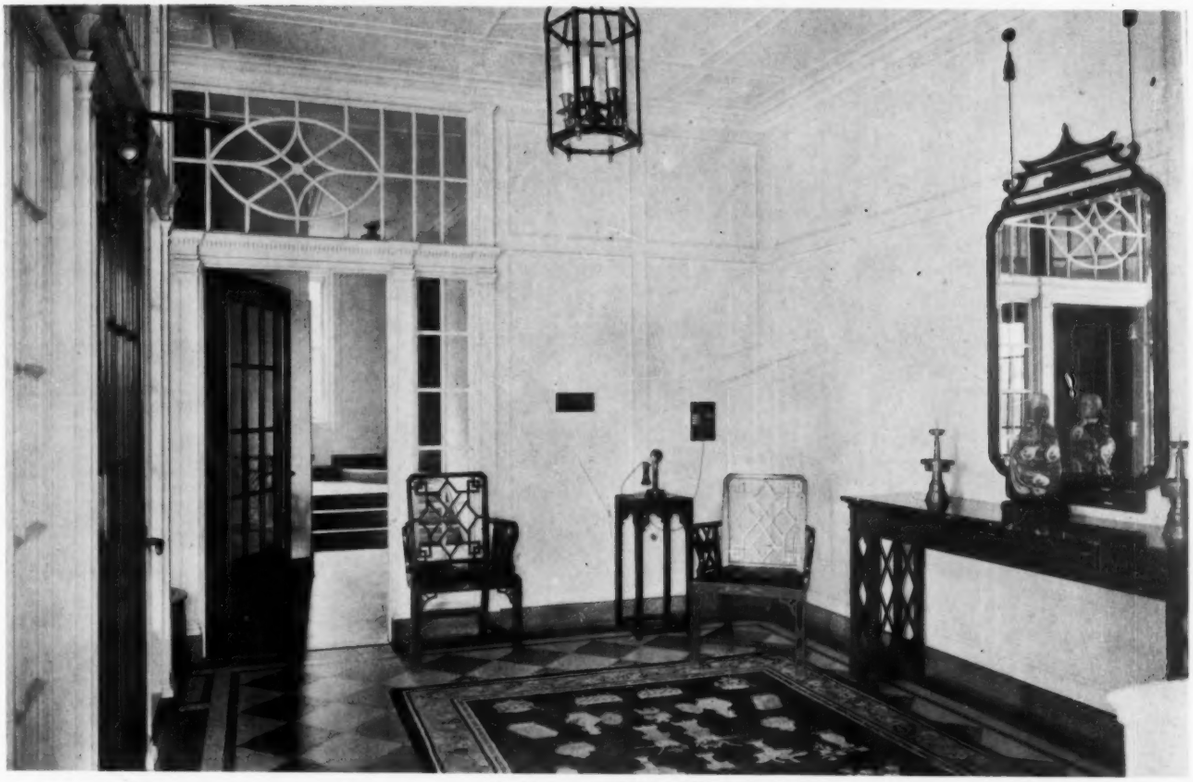
The material market has already shown substantial reductions in price and most authorities are agreed that minimum prices have been reached. Other commodities may continue to show price reductions but the conditions that govern them and building materials are not analogous. There are no large stocks of building materials on hand and the indication is that manufacturers will close their plants before reducing prices further. Quotations of building materials have remained steady for a considerable time in spite of severe tests and it is now evident that present prices are very near basic costs, as the manufacturers claim.

When arrangements can be made now for the delivery of material next spring it will be found advantageous. The large amount of construction which is expected to assume definite shape early next year will place a heavy tax on the material market. It must also be borne in mind that the program of road construction laid out this year has largely been deferred and this will necessitate a large consumption of the same materials that are used in building construction. The readjustment of the railroads, involving large amounts of new construction and equipment, will also constitute an important factor. It is unlikely, therefore, that lower prices can be expected in building materials; it is more likely that with a spirited demand and small stocks the price movement will be upward. Should this be true the extra cost of materials will be more than offset by the greater efficiency of labor.

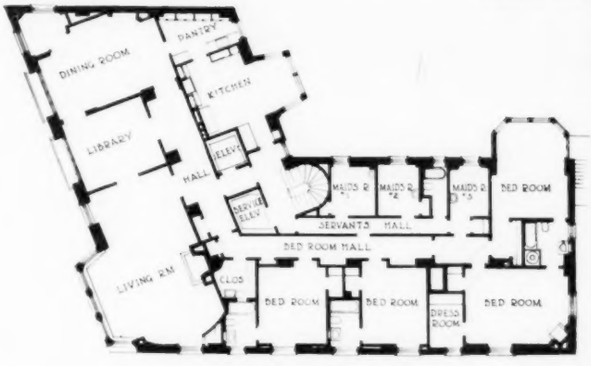
GENERAL VIEW

APARTMENT BUILDING, SHERIDAN ROAD, CHICAGO, ILL.

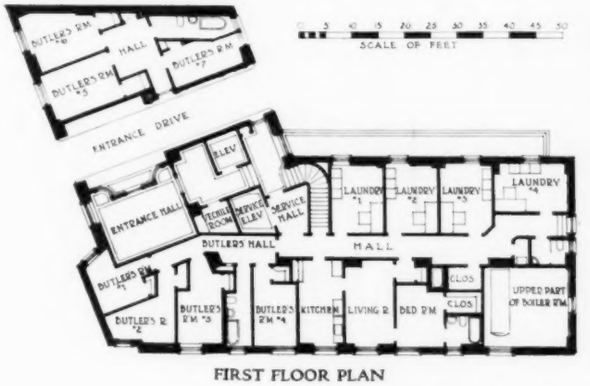
RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS



PUBLIC ENTRANCE HALL



TYPICAL FLOOR PLAN

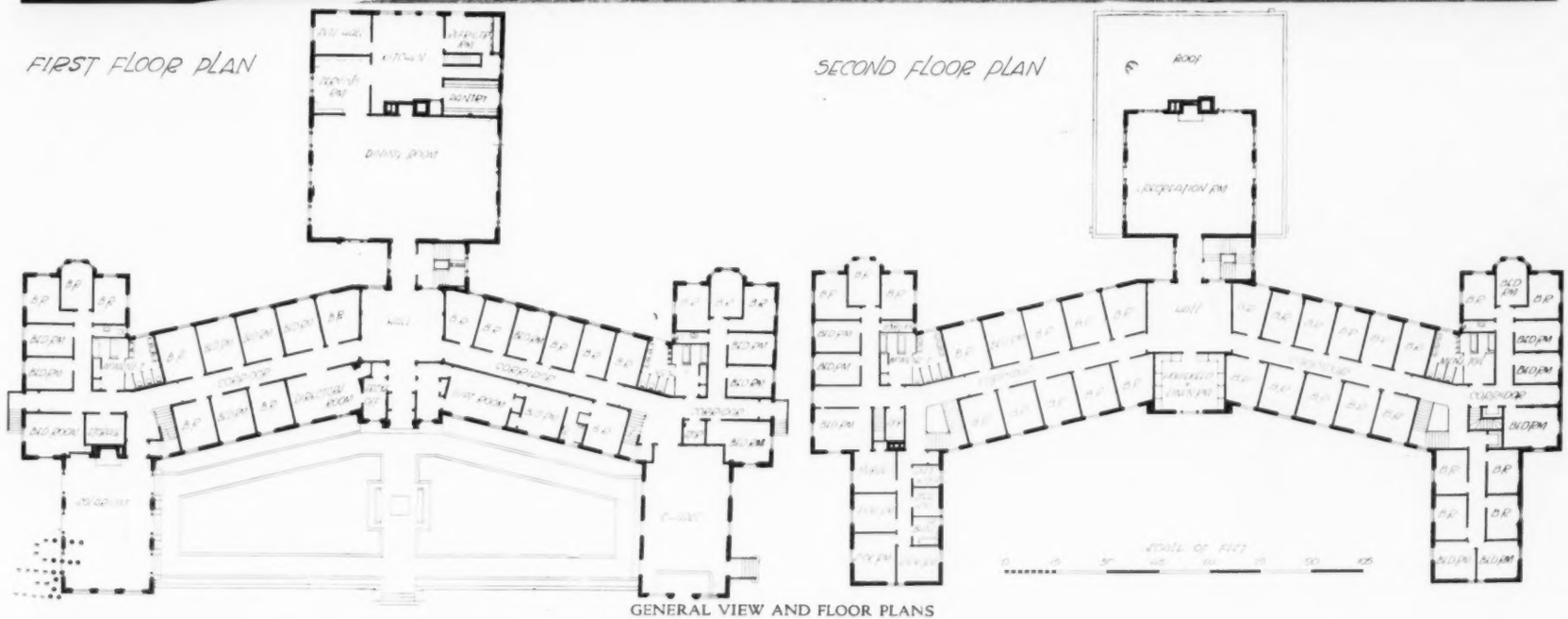


FIRST FLOOR PLAN

MAIN ENTRANCE DETAIL

APARTMENT BUILDING, SHERIDAN ROAD, CHICAGO, ILL.

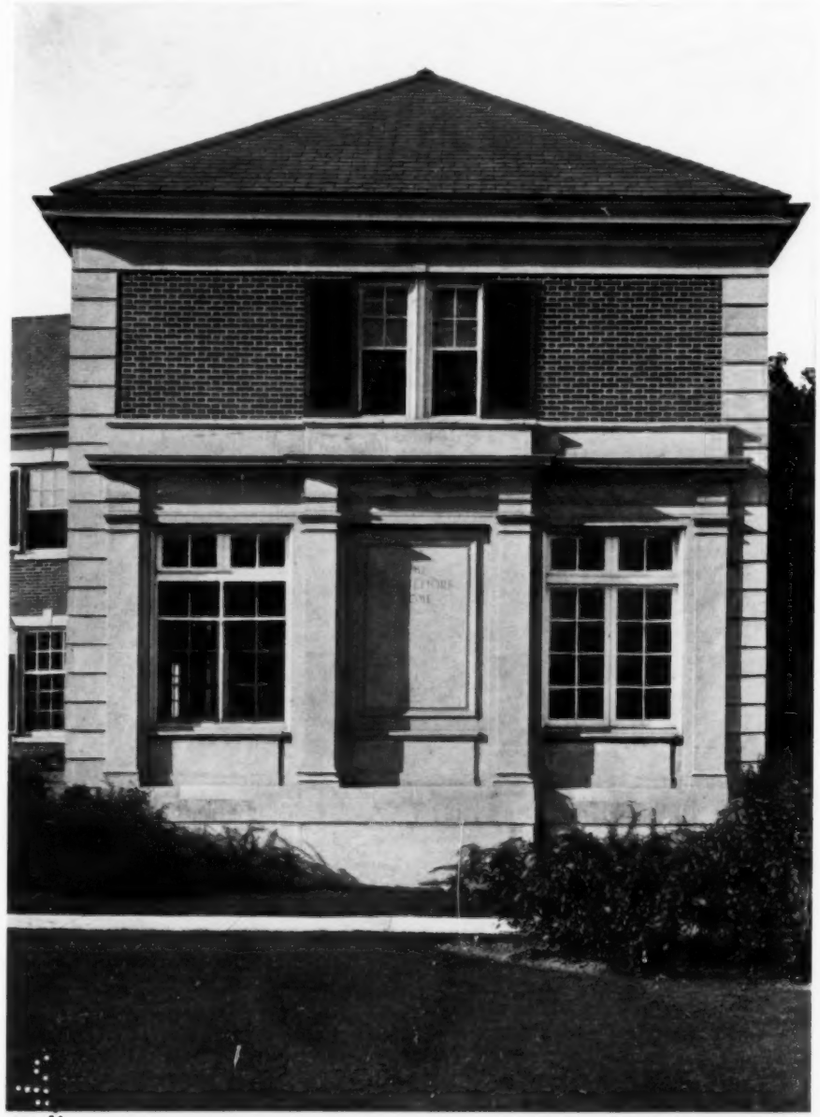
RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

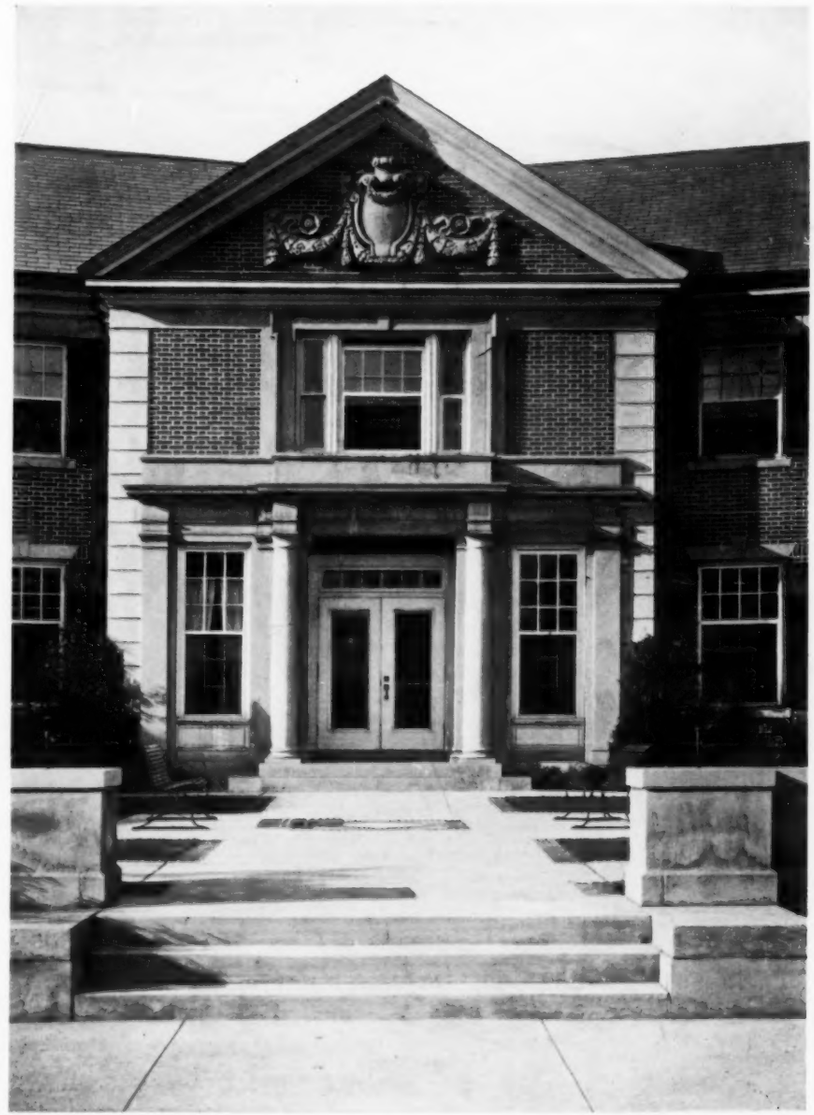


GENERAL VIEW AND FLOOR PLANS

MONTEFIORE HOME, CLEVELAND HEIGHTS, OHIO

CHARLES R. GRECO, ARCHITECT

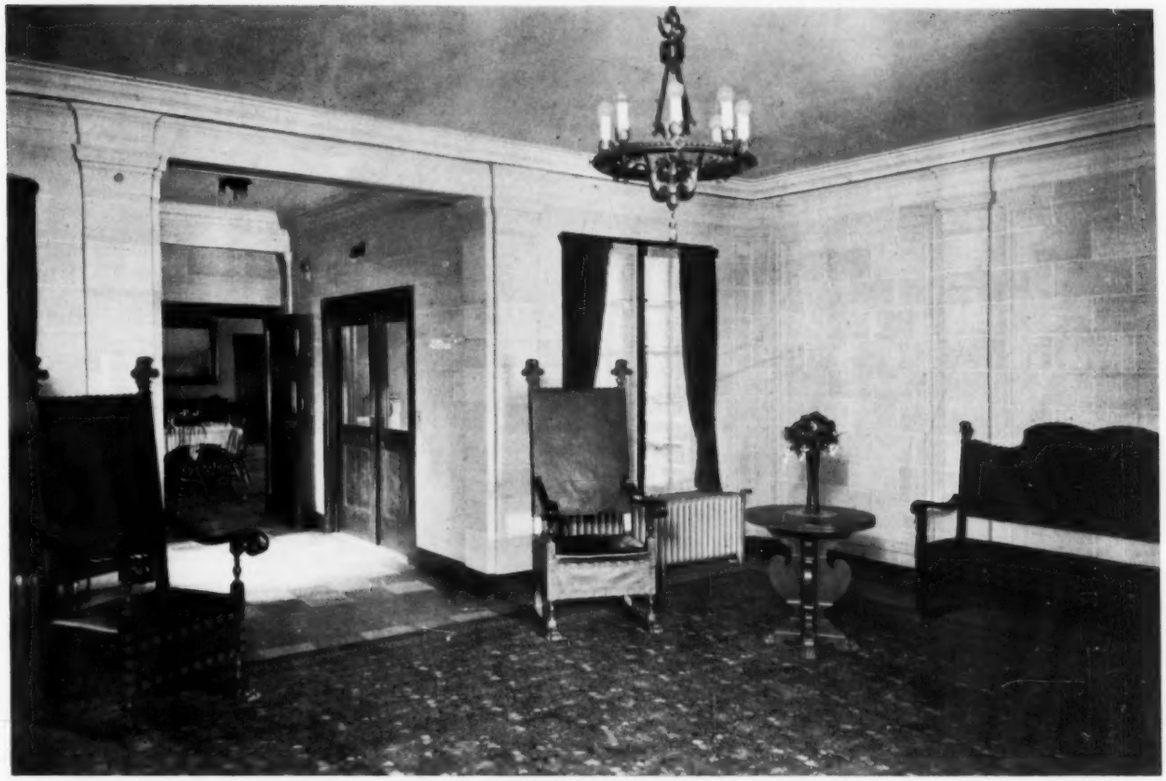




CHAPEL WING AND MAIN ENTRANCE

MONTEFIORE HOME, CLEVELAND HEIGHTS, OHIO

CHARLES R. GRECO, ARCHITECT

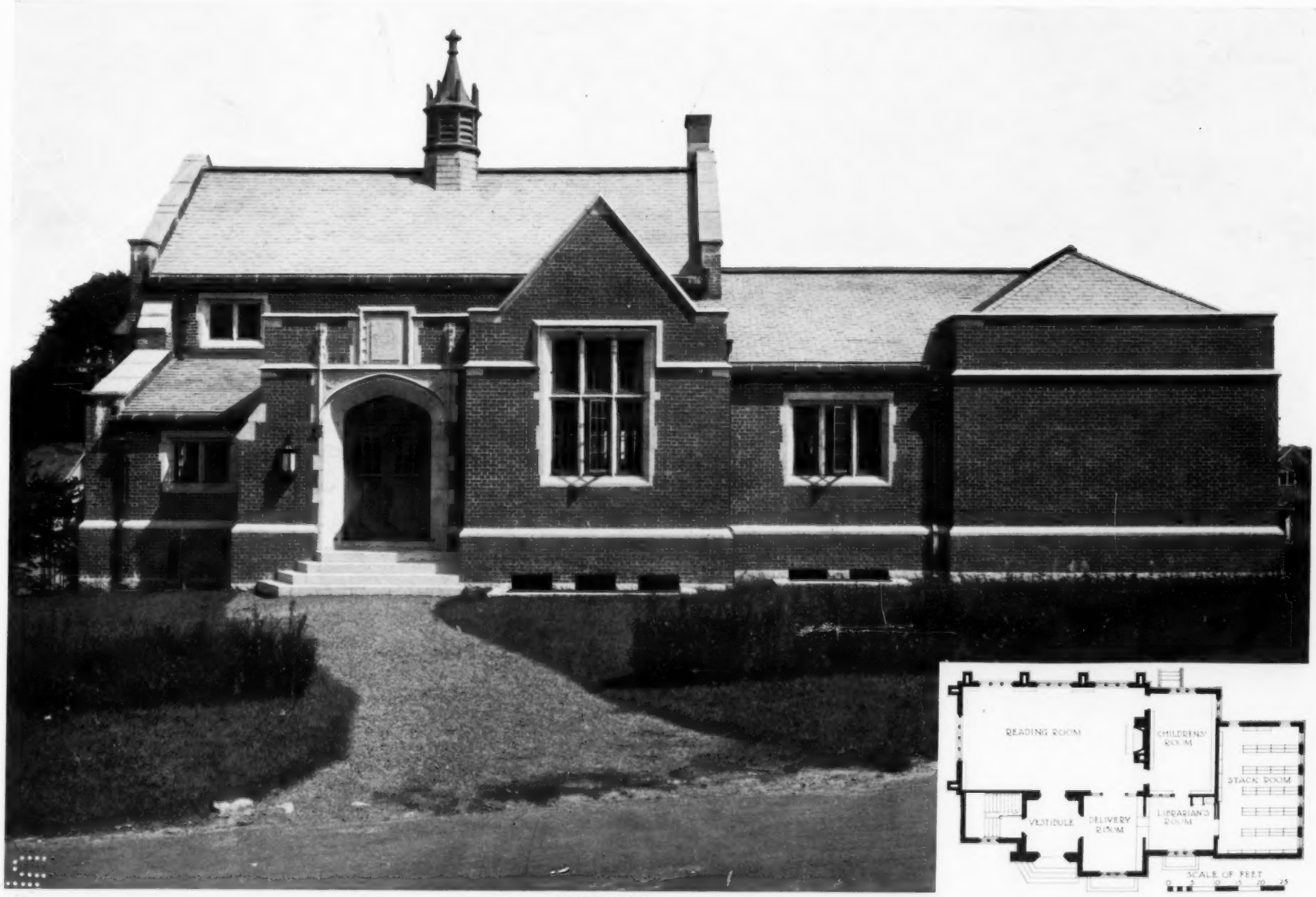


ENTRANCE HALL

VIEW IN SOLARIUM

MONTEFIORE HOME, CLEVELAND HEIGHTS, OHIO

CHARLES R. GRECO, ARCHITECT



MAIN FRONT

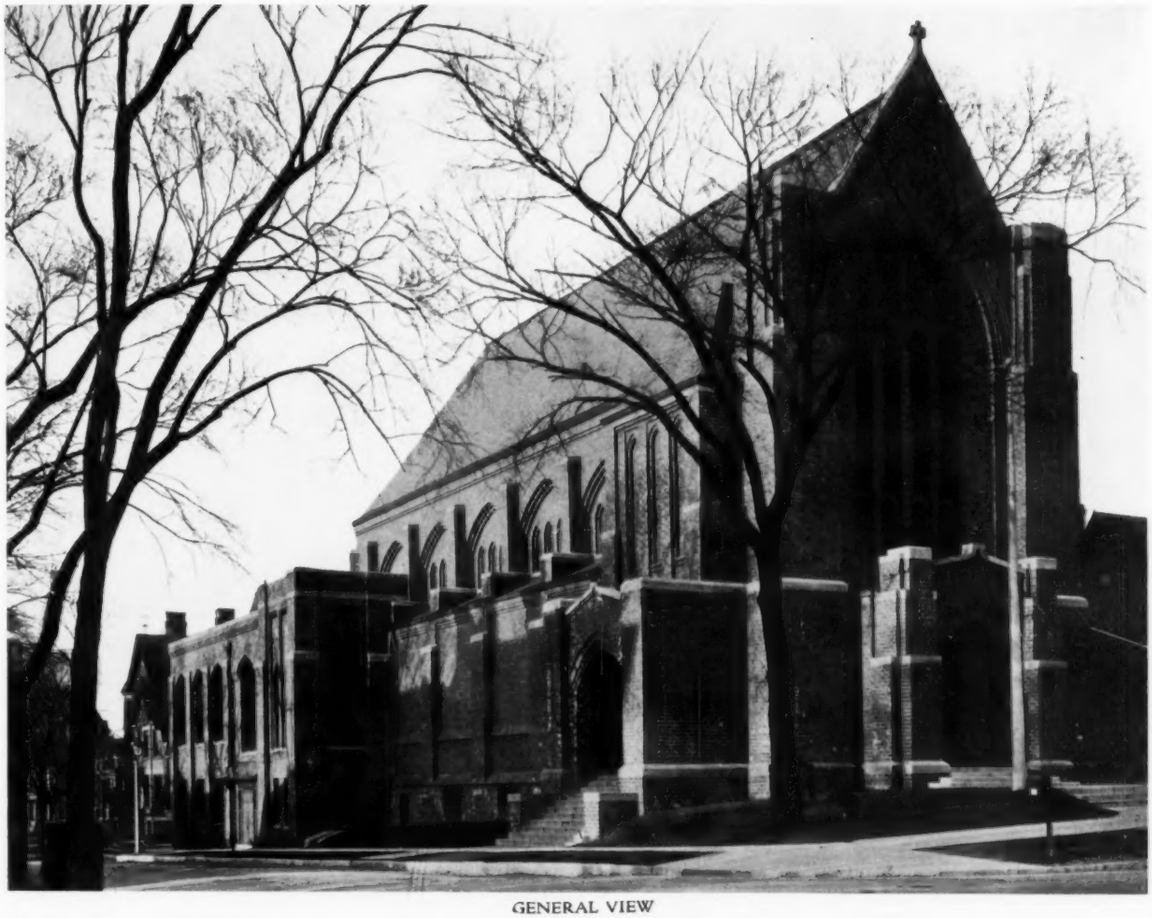
TOBEY MEMORIAL LIBRARY, WAREHAM, MASS.

E. M. PARSONS & CO., ARCHITECTS

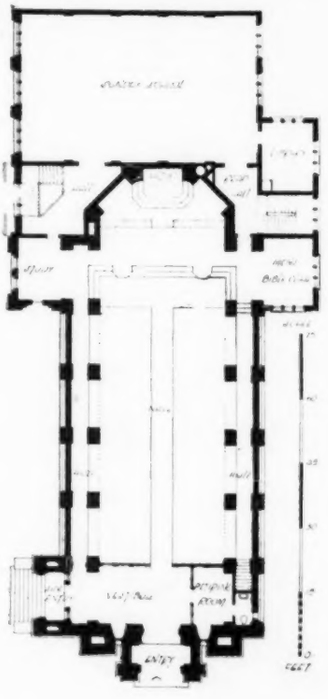
DETAILS OF READING ROOM

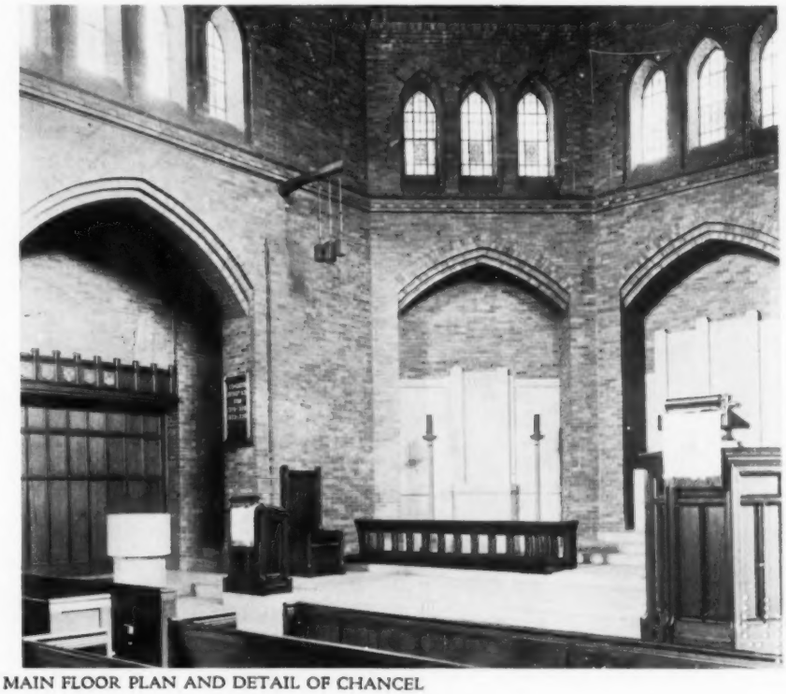
TOBEY MEMORIAL LIBRARY, WAREHAM, MASS.

E. M. PARSONS & CO., ARCHITECTS



GENERAL VIEW





MAIN FLOOR PLAN AND DETAIL OF CHANCEL

CHURCH OF THE REDEEMER, MILWAUKEE, WIS.

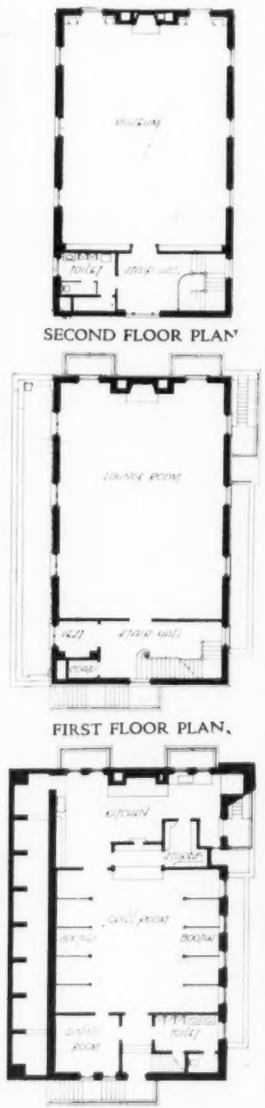
SCHUCHARDT & JUDELL, ARCHITECTS

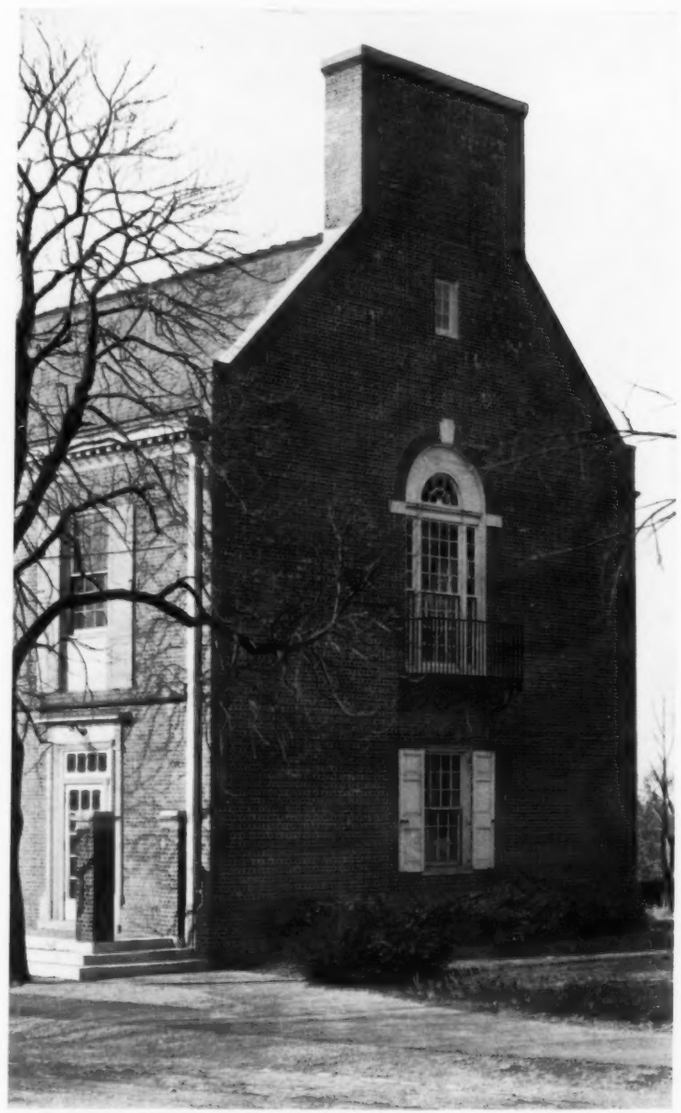
MAIN FRONT

BUILDING FOR THE PEABODY COLLECTION, PHILLIPS ACADEMY, ANDOVER, MASS.

GUY LOWELL, ARCHITECT

STAIR HALL





END DETAIL

BUILDING FOR THE PEABODY COLLECTION, PHILLIPS ACADEMY, ANDOVER, MASS.

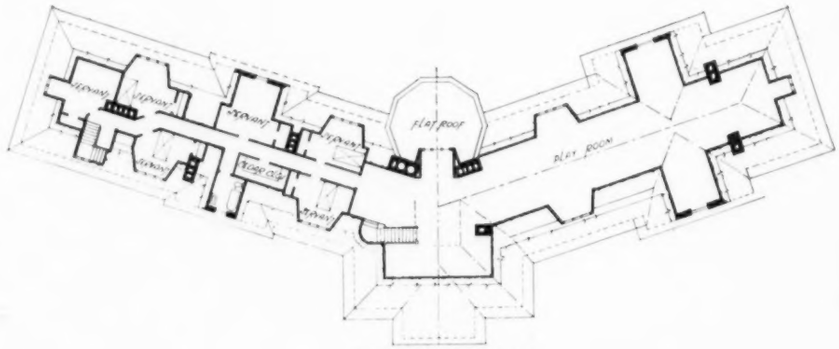
GUY LOWELL, ARCHITECT

GARDEN FRONT

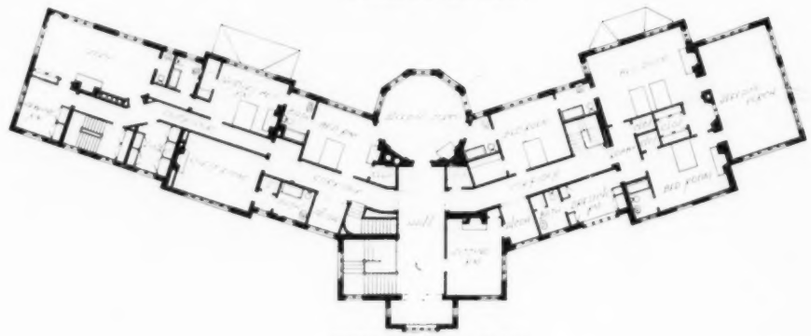
ENTRANCE FRONT

COUNTRY HOUSE AT COLUMBUS, OHIO

RICHARDS, McCARTY & BULFORD, ARCHITECTS



THIRD FLOOR PLAN



SECOND FLOOR PLAN

FIRST FLOOR PLAN

DETAIL OF ENTRANCE PORCH

COUNTRY HOUSE AT COLUMBUS, OHIO

RICHARDS, McCARTY & BULFORD, ARCHITECTS

LIVING ROOM

LIBRARY

COUNTRY HOUSE AT COLUMBUS, OHIO

RICHARDS, McCARTY & BULFORD, ARCHITECTS

SUN ROOM

MAIN HALL

COUNTRY HOUSE AT COLUMBUS, OHIO

RICHARDS, McCARTY & BULFORD, ARCHITECTS

GENERAL VIEW

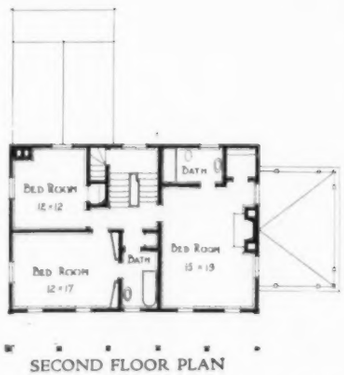
HOUSE OF RAYMOND S. CLARK, ESQ., GREAT NECK, LONG ISLAND, N. Y.

ALFRED HOPKINS. ARCHITECT

CORNER OF SERVICE SIDE

VIEW OF GARDEN SIDE

FIRST FLOOR PLAN



SECOND FLOOR PLAN

HOUSE OF RAYMOND S. CLARK, ESQ., GREAT NECK, LONG ISLAND, N. Y.

ALFRED HOPKINS, ARCHITECT